

in Cider[®]

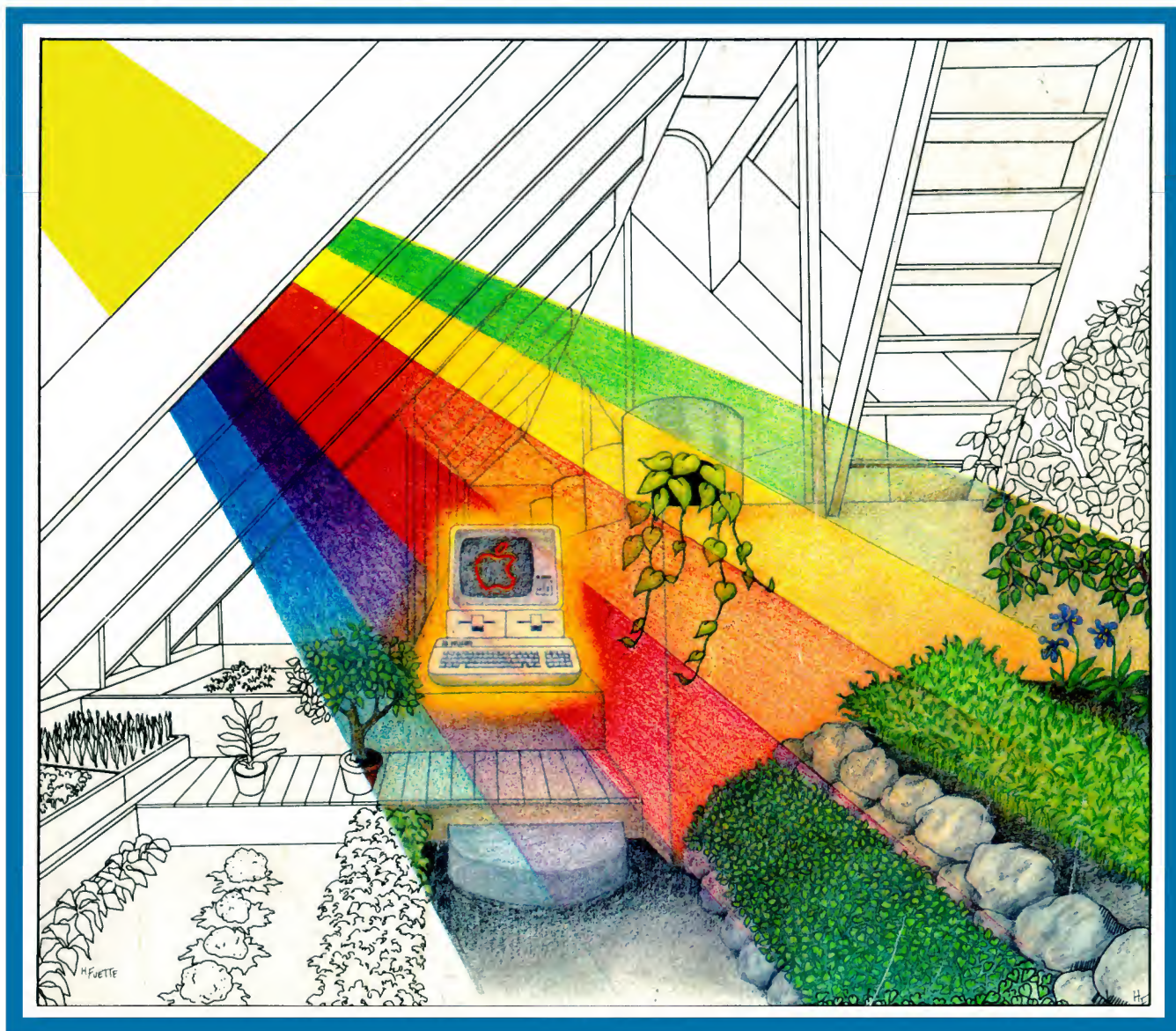
Green's Apple* Magazine

Pit Yourself Against Our Viper

February 1984 USA \$2.95

Energy: Apples Tap the Spectrum

- Apple & Sun, Inc.
- How to Slash Your Fuel Bills



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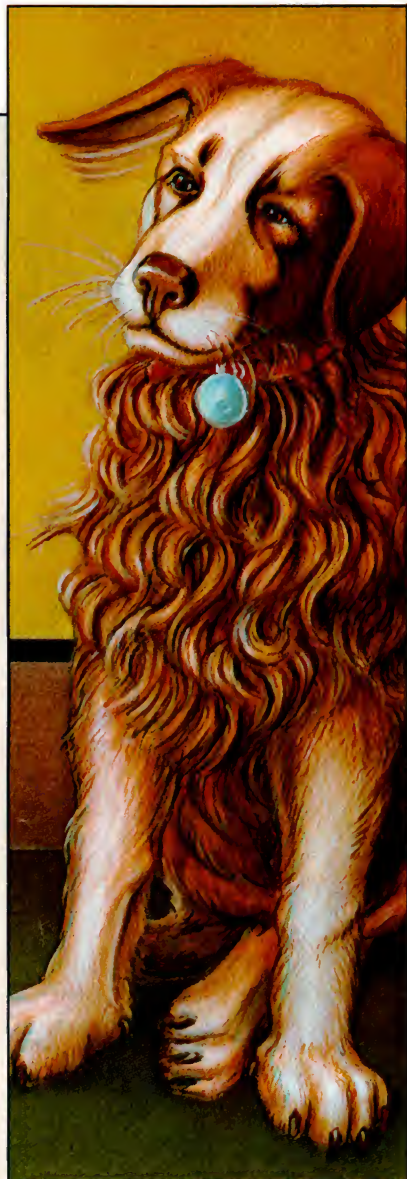


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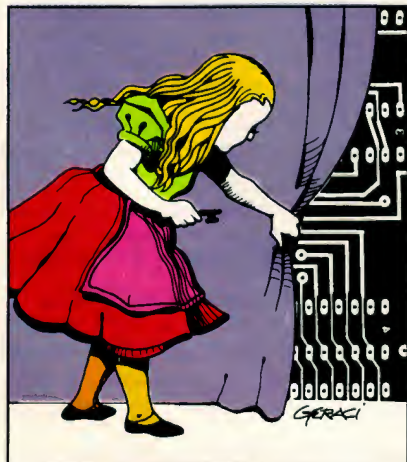
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The Solar Connection 34

There's much more to "passive solar" than the name might imply. Your Apple will help you unravel the subtleties of putting solar energy to work for you.

by Bill Smith

A Solar Survey 42

Building? Use your number-one sun to make that new structure more energy-efficient. Here's a list of "solar software" to help you compute the best design possible.

by Terry Brennan

F-Load: A Solar Design Tool 44

The author describes one of the better energy analysis programs written for the Apple. Its unique algorithm and its ability to calculate heating and cooling requirements make it a versatile choice.

by Joe Kohler

Tackling the Building Environment 52

An Apple-driven energy monitoring system in your place of business will pay for itself in short order.

by Nancy White Kelly and Carol M. Clerke

The Alternative Apple 58

A lack of utility power need not keep you from using your Apple anywhere you please. Just get a battery and inverter, and take charge of the situation.

by John Davidson

Computer Music Worth Listening To 68

Ever been assaulted by the cacophony known as computer music? Here's how to invoke a little-known law of nature and bring out the true musical genius hidden in your Apple.

by Jonathan Kandell

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Fair Warning: Don't try this stealthy little game if you are easily rattled.

by Dennis M. Marks

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One way to deal with—and learn from—your programming gaffes is to put them on file.

by Molly Watt

Load Machine Language and MBasic Together 88

One of the nice things about CP/M is its ability to facilitate sensible programming techniques. Here's an excellent example of just that.

by Paul M. Danzer



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The cover art by Holly Fuetter is taken from the Ark, a bioshelter at the New Alchemy Institute on Cape Cod. The Ark is a research facility integrating investigations into advanced solar design and engineering, energy conservation, horticulture and pest control, solar aquaculture, hydroponics and computer modeling. For more information write The New Alchemy Institute, 237 Hatchville Road, East Falmouth, MA 02536.

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Submissions: We're always looking for first-class manuscripts at *inCider*. If you have written a useful or entertaining program for the Apple, why not share it? Conversions of programs published in *80 Micro* or *Microcomputing* are also welcome. We'll consider publication of any material for the Apple. Guidelines for budding authors are available—just address an envelope to yourself and include it with your request.



The Alternative Apple, p. 58

Fermentations

by Peg LePage
inCider staff

Apple Energy

It is the middle of winter for those of us in the Northern Hemisphere, a time when the need for energy is particularly on our minds. And, when people think of energy these days, it's often of conservation and alternative energy sources. We at *inCider*, therefore, decided it would be timely and informative to look at how microcomputers are being used in these closely allied fields.

According to Bill D'Alessandro of *Solar Age* magazine, more and more architects and builders are using micros to help design new construction and alterations (retrofits) that use energy conservation and alternative energy strategies to make them more energy, and therefore cost, efficient. Often these people first bought a microcomputer for office record keeping. Now they are discovering the power of their machine in professional applications.

The power lies in the ability of a computer to model a structure in various configurations by manipulating a number of parameters simultaneously, and by doing the accompanying raft of calculations in a short time. This type of mathematical analysis could take days, or even be impossible, by hand.

The bulk of energy conservation and alternative energy activity is occurring in the area of solar construction and particularly in passive solar systems where a building itself acts as a collector of solar radiation. The selection of software available reflects this bias. Relatively smaller amounts of software apply to active solar in which radiation is collected in independent units and transported as heat to the structure, as well as to daylighting, photovoltaic generation of electricity, wind and water power, and others. We have, therefore, laid our emphasis on passive solar.

Most energy software is written—and priced—for the professional; and professionals suggest that this is necessarily so because of the expertise needed to prepare input and interpret output. However, software designed and priced for the layperson is appearing. Two packages are mentioned in "A Solar Survey" in this magazine. *inCider* plans to publish reviews of these programs in the near future.

In the present issue, you might turn first to "The Solar Connection" by Bill Smith for a primer on passive solar design. He describes various types of passive systems from the familiar greenhouse to the water wall, parameters and calculations involved in their analysis and design, and the input and output of a typical passive solar design program.

Terry Brennan then makes "A Solar Survey" of much of the software currently available for solar design with an Apple. He includes a brief description of each, as well as information on where to get it and how much it costs. Most are passive design programs, but he does mention active, photovoltaic and daylighting packages as well.

Joe Kohler focuses on one of the most comprehensive and powerful of these packages with an in-depth review entitled "F-Load: A Solar Design Tool." This review is valuable not only for its description and evaluation of a specific program, but as a detailed look at how a solar design program works.

While our emphasis has been on passive solar design, we have included two other articles to tweak your fancy. In "Tackling the Building Environment," co-authors Nancy White Kelly and Carol M. Clerke relate how one man and his Apple are helping a number of businesses lower

their expenses by cutting peak electrical usage. Carl Rutherford analyzes a customer's energy needs, and installs and then maintains, by modem, a system that monitors and controls lights and electrical equipment so power consumption never goes beyond a specified level.

For a change of pace, suppose you have built a home or business that uses an alternative source of electricity—photovoltaic cells, wind or water power—to produce direct current to charge storage batteries. How could you run your Apple from such a system? John Davidson reveals an answer in "The Alternative Apple," and also suggests that, thus equipped, you could take your electronic friend places you'd never dreamed.

As you read about the software mentioned in these articles, please keep in mind that whether it is designed for professionals or laypeople, care in preparing input is essential. "Garbage in, garbage out" means lots of money over the years when you're building or retrofitting a structure. The layperson, unfamiliar with the particulars of solar design, should also understand that considerable effort will be involved in researching this input for accuracy and in assessing the implications of the output for actual construction. It may be necessary to seek assistance.

Featuring Apples and energy in this issue of *inCider* is meant as a beginning rather than a *fait accompli*. We hope to publish articles on this subject on a continuing basis. Please let us know if such articles are of interest to you, and what kinds in particular would be most helpful. Also, please let us know about software—commercial, nonprofit or homemade—that we have not mentioned. Of course, queries on manuscripts are always welcome, too. ■

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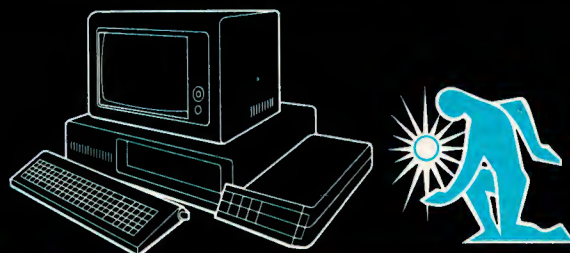
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PROMETHEUS

Letters

New Wizardry Techniques

Following are some changes I made to Kerry Lantz's "Wizfix" article that appeared in the August issue. Basically, what I wanted to change was the fact that I could not choose the age or quality points individually for the characters. In other words, it was either be 18 years old or remain as you are; and be 18 in every quality or remain as is.

A word about the ages I've chosen: As you'll see, I've arbitrarily used a minimum of 18 and a maximum of 65. Those ages can be altered to suit the individual simply by changing lines 550 and 551 to reflect whatever pa-

rameters are desired. As Kerry pointed out in a letter to me, Wizardry will accept ages much below 18, and while it will accept old characters, it doesn't treat them well at all. Even 65 is much too old for a character to be effective. But I like the idea of choices and the ability to experiment. So feel free to mess around.

The subroutines I wrote reside at lines 548 to 593 and will overwrite lines 550 and 555.

First, change the word YOUTH in line 365 to AGE. Then change line 445 as in Listing 1.

Then comes the fun part. The new subroutines follow. Lines 548 to 554

handle the choice of age. Lines 555 to 593, as in Listing 2, handle the individual characteristics.

Alan Popow
#1107-9810-105 Street
Edmonton, Alberta
T5K 1A6

I would like to submit the following changes/additions to the "Wizfix" program by Kerry Lantz (August). See Listing 3.

Lines 203, 204 and 850 print the character's current name and password. They also zero the remaining positions in those fields. Wizardry does not set those positions to zero.

```
445 ON B GOSUB 500,505,510,515,520,525,530,535,540,545,548,555:
      GOSUB 200:GOSUB 300:GOTO 410
```

Listing 1.

```
548 POKE 35,24:HOME:PRINT TAB(18) "AGE"
549 PRINT TAB(18) "----":PRINT:PRINT:PRINT:PRINT "PRESENT AGE IS":
      OL
550 VTAB 15:INPUT "NEW AGE FOR CHARACTER (MIN 18,MAX 65)":AN#: AN =
      VAL (AN#)
551 IF AN<18 OR AN>65 THEN 550
552 NG = INT (AN/4)
553 IF NG * 4 + NG - 1 > AN THEN NG = NG - 1:GOTO 553
554 POKE BASE + 39,NG:POKE BASE + 38,(AN - (NG * 4 + NG - 1))*52:
      GOSUB 225:GOSUB 350:POKE 35,15: RETURN
555 POKE 35,24:HOME:PRINT TAB(15) "QUALITIES":PRINT TAB(15)
      "-----":PRINT:PRINT
556 PRINT "A) STRENGTH "I1:HTAB 22:PRINT "D) VITALITY "I1:
      PRINT:PRINT "B) INTELLIGENCE "I1:HTAB 22:PRINT "E) AGILITY
      "I1:PRINT:PRINT "C) PIETY "I1:HTAB 22:PRINT "F) LUCK "I1:
557 VTAB 18:PRINT "CHOOSE WHICH ONE YOU WISH CHANGED":PRINT
      "<RETURN> TO GO BACK TO PAGE 1":POKE -16368,0:GET B#: B =
      ASC(B#) - 64:PRINT
558 IF B = - 51 THEN GOSUB 350:POKE 35,15: RETURN
559 IF B < 1 OR B > 6 THEN 557
560 ON B GOTO 565,570,576,580,585,591
565 VTAB 18:CALL -958:VTAB 20:INPUT "CHANGE STRENGTH TO: (MIN
      6,MAX 18)":SN#: SN = VAL (SN#)
566 IF SN < 6 OR SN > 18 THEN 565
```

```
567 POKE BASE + 44,PEEK (BASE + 44) + SN - ST:GOSUB 230:GOTO
      555
570 VTAB 18:CALL -958:VTAB 20:INPUT "CHANGE I.O. TO: (MIN 6,MAX
      18)":ON#:ON = VAL (ON#):IF ON < 6 OR ON > 18 THEN 570
571 PK = 32 * (ON - 8 * (PEEK (BASE + 45) - INT (PEEK (BASE + 45)
      / 4) * 4)) + (PEEK (BASE + 44) - 32 * INT (PEEK (BASE + 44) /
      32))
572 IF PK < 0 THEN PK = PK + 256:POKE BASE + 45,PEEK (BASE + 45)
      - 1:GOTO 572
573 IF PK > 255 THEN PK = PK - 256:POKE BASE + 45,PEEK (BASE + 45)
      + 1:GOTO 573
574 POKE BASE + 44,PK
575 GOSUB 230:GOTO 555
576 VTAB 18:CALL -958:VTAB 20:INPUT "CHANGE PIETY TO: (MIN 6,MAX
      18)":PN#: PN = VAL (PN#)
577 IF PN < 6 OR PN > 18 THEN 576
578 POKE BASE + 45,PN * 4 + (PEEK (BASE + 45) - INT (PEEK (BASE +
      45) / 4) * 4):GOSUB 230:GOTO 555
580 VTAB 18:CALL -958:VTAB 20:INPUT "CHANGE VITALITY TO: (MIN
      6,MAX 18)":VN#: VN = VAL (VN#)
581 IF VN < 6 OR VN > 18 THEN 580
582 POKE BASE + 46,PEEK (BASE + 46) + VN - VI:GOSUB 350:GOTO
      555
585 VTAB 18:CALL -958:VTAB 20:INPUT "CHANGE AGILITY TO: (MIN
      6,MAX 18)":LN#:LN = VAL (LN#):IF LN < 6 OR LN > 18 THEN 585
586 PK = 32 * (LN - 8 * (PEEK (BASE + 47) - INT (PEEK (BASE + 47)
      / 4) * 4)) + (PEEK (BASE + 46) - 32 * INT (PEEK (BASE + 46) /
      32))
587 IF PK < 0 THEN PK = PK + 256:POKE BASE + 47,PEEK (BASE + 47)
      - 1:GOTO 587
588 IF PK > 255 THEN PK = PK - 256:POKE BASE + 47,PEEK (BASE + 47)
      + 1:GOTO 588
589 POKE BASE + 46,PK
590 GOSUB 230:GOTO 555
591 VTAB 18:CALL -958:VTAB 20:INPUT "CHANGE LUCK TO: (MIN 6,MAX
      18)":LN#: LN = VAL (LN#)
592 IF LN < 6 OR LN > 18 THEN 591
593 POKE BASE + 47,LN * 4 + (PEEK (BASE + 47) - INT (PEEK (BASE +
      47) / 4) * 4):GOSUB 230:GOTO 555
```

Listing 2.

ADD:

```
203 TP = PEEK (BASE + 16):FOR K = (16 + TP + 1) TO 31:
      POKE BASE + K,0:NEXT
```

```
204 TN = PEEK (BASE):FOR K = TN + 1 TO 15:
      POKE BASE + K,0:NEXT
```

CHANGE 660-662 to:

```
660 VTAB 21:HTAB 1:PRINT "TYPE NUMBER OF OBJECT TO DROP":
      PRINT " (0 TO EXIT)":POKE -16368,0:GET B$:
      B = ASC (B$):IF B < 48 OR B > 56 THEN 660
```

```
661 B = B - 48:IF B > T(0) THEN 660
```

```
662 IF B = 0 THEN GOTO 652
```

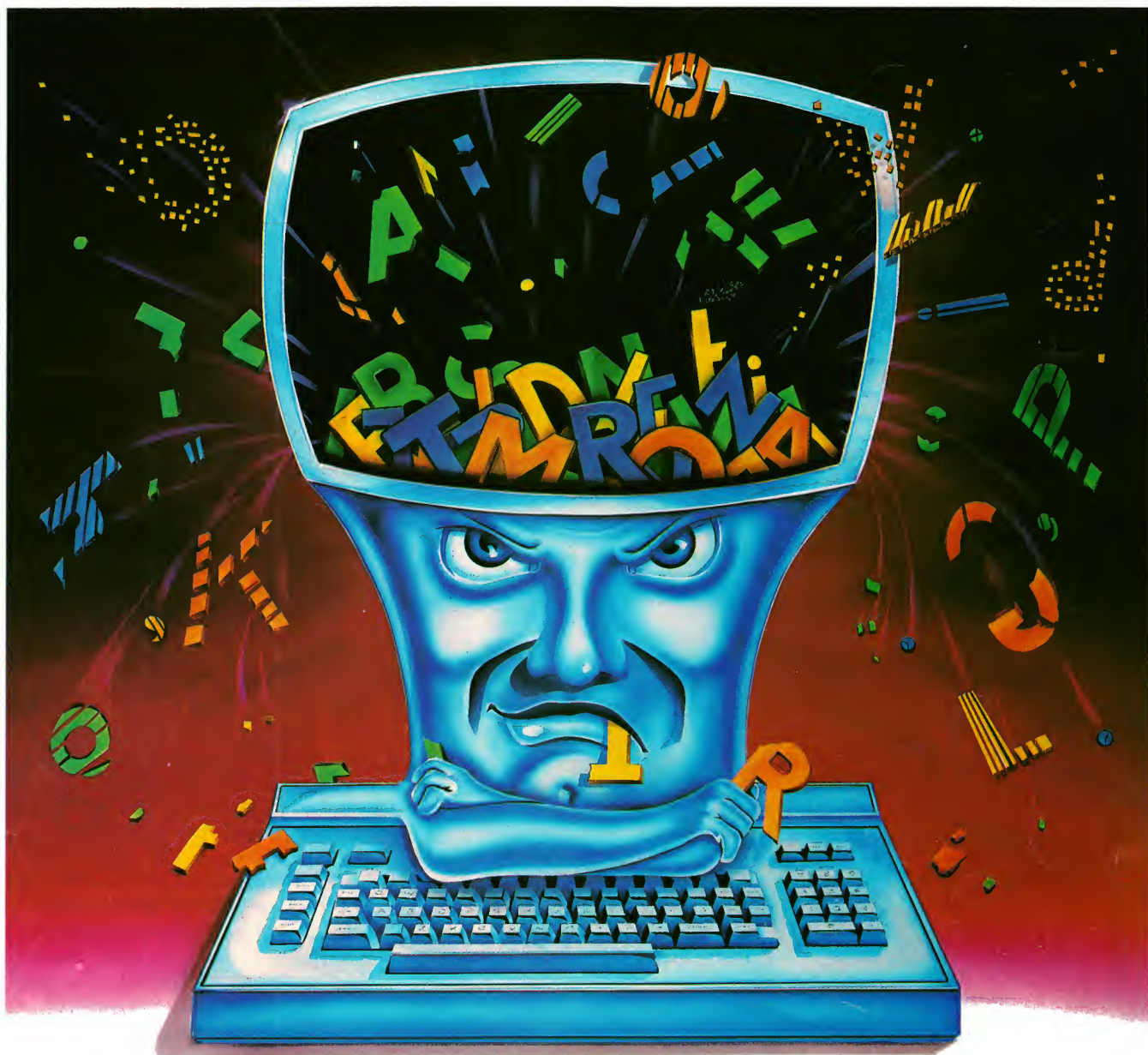
```
663 FOR K = B TO 8:POKE BASE + 58 + 8 * K,PEEK (BASE +
      66 + 8 * K):NEXT:POKE BASE + 122,0
```

```
664 POKE BASE + 58,PEEK (BASE + 58) - 1:GOTO 652
```

CHANGE 850 to:

```
850 FOR K = 1 TO 20:POKE 47084,TRK(K):POKE 47085,SEC(K):
      CALL 768:N$(K) = "":TN = PEEK (BASE):FOR L = 1 TO TN:
      N$(K) = N$(K) + CHR$(PEEK (BASE + L)):NEXT:NEXT:
      RETURN
```

Listing 3.



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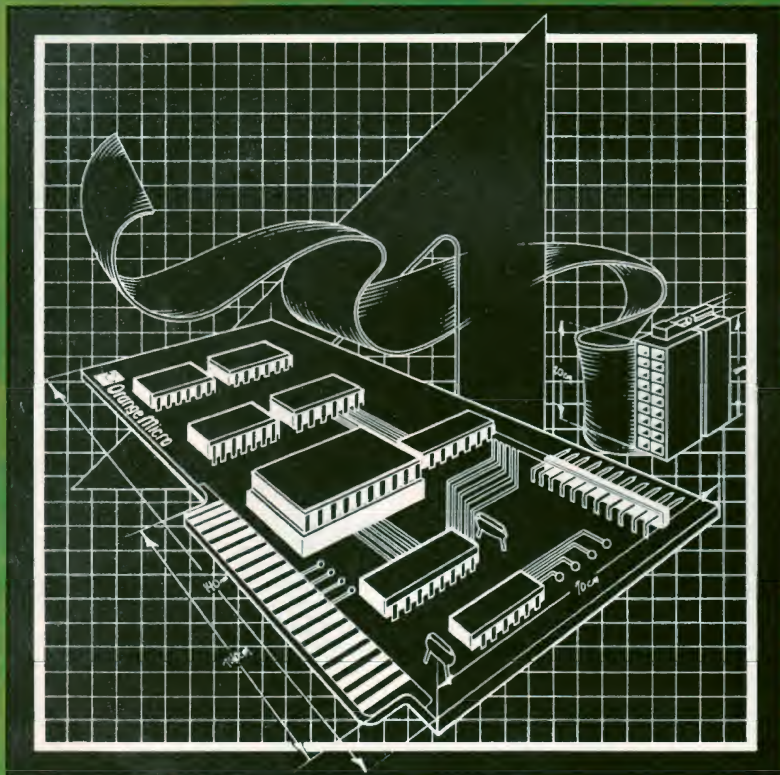
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Letters

Therefore, a deleted password will show up in the character's stats in the published version of *Wizfix*. Similarly, if a character with a shorter name occupied the same area as a former character, the additional letters were displayed. After running *Wizfix* with these changes included, the name and password fields will be correct.

Lines 660 and 662 allow you to enter a 0 to exit from the "Drop an Item" screen if you change your mind about dropping an item. Line 661 checks to insure that you don't enter an item number greater than is currently in use.

William I. Walters
PO Box 805
APO New York 09021

The Common Code

I have enjoyed your publication so much that I just renewed my subscription for three years!

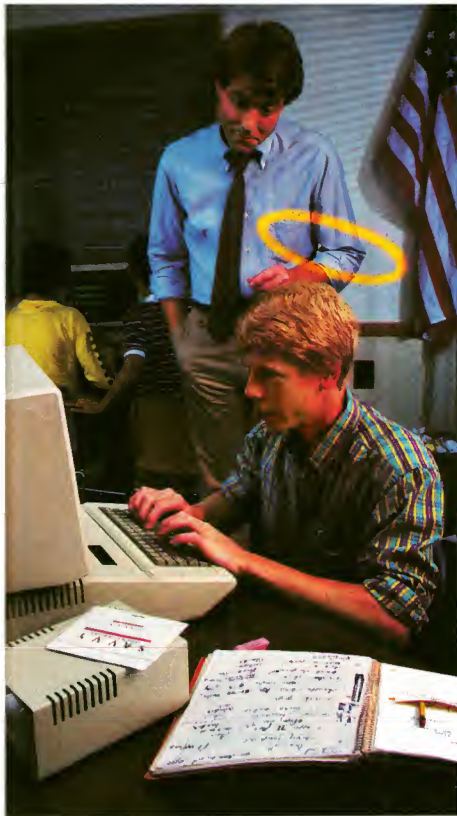
I just purchased a "Magic Wand Speak & Learn" bar code reader by Texas Instruments. The unit was on sale for \$29.93, and I purchased it for my five-year-old son, Brian. If they can produce a bar code reader that can read bar code in children's books, then something a little more elaborate could be made for the Apple.

I am also interested in finding out what type of printer and software are available that can print out bar code to make up labels for back issues and other uses. Could a bar code daisy wheel be developed to be used with existing printers?

George Cawthorne
1721 East Kensington
Mt. Prospect, IL 60056

There has been some discussion in the Letters section of *inCider* about using bar code to encode the program listings published by the magazine. It could well be practical to combine bar codes with an inexpensive device sold commercially or a smaller unit made at home from parts cannibalized from something like a Texas In-

Address letters to: Letters to the Editor, inCider, Editorial Offices, Pine St., Peterborough, NH 03458.



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Plain Talk About Printers...

DOT MATRIX

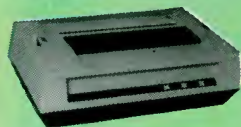
There've been some big changes in the low-end printer market. There are interesting new printers from Panasonic, Tally & Toshiba, plus new entries by old stand-bys. Compatibility with **software** remains your biggest hurdle.

ANADIX

DP-9501B	\$1119.88
DP-9620B	\$1199.88
DP-9625B	\$1299.88
WP-5000	\$2349.88

C. ITOH*

Prowriter



C. Itoh's Prowriter (120 cps) offers you 10, 12, & 16 cpi, a proportional/correspondance font, dot graphics (160x144 dpi), friction/tractor feed & a 1.5K buffer. The Prowriter 2 is the 136 column version.

Prowriter	\$339.88
Prowriter 2	\$719.88

DIABLO

Series 32	\$1049.88
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EPSON*

FX/RX Series

The RX-80 & RX-80 F/T (100 cps) are upgraded versions of the MX Series and are fully code-compatible with all software for the MX-80 with Graftax.

Call for specs & delivery on the FX-80 (160 cps) and FX-100. RX/FX Epso is. \$CALL

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Prism 80	\$1079.88
w/4-color	\$1439.88
Prism 132	\$1239.88
w/4-color	\$1669.88
MicroPrism	\$529.88

INFORUNNER

Riteman	\$329.88
---------	----------

MANNESMANN TALLY

MT-160 L/180 L Spirit



The MT-160L (160 cps) offers 10, 12, 17 & 20 cpi, a superior correspondence font, parallel and RS-232C interfacing (controlled from the front panel), plus friction/tractor feed. The MT-180L is the 136 column version.

The Spirit (80 cps) has 10, 12 & 17 cpi fonts, italics, friction/tractor feed, and a unique square-wire printhead that produces sharp output.

MT-160 L	\$649.88
MT-180 L	\$849.88
MT-Spirit	\$329.88

OKIDATA*

Microline Series



The Microline 92 (80 col) & 93 (132 col) are ideal for word processing.

They offer a 160 cps d aft mode, a 40 cps correspondence mode, 10, 12 & 17 cpi (w/double-width), pin/friction feed (tractor is optional on the 92) & dot-addressable graphics (120 x 144). Centronics parallel interface is standard.

The Microline 84 Step 2 (132 col) features 200 cps, 10, 12, & 17 cpi (w/double-width), a correspondence mode & dot addressable graphics. Parallel interface is standard.

The Microline 82A (80 col) & 83A (132 col) are data crunchers period. They print 120 cps, at 10 & 16 cpi (5/8 double-width). Dot-addressable graphics are optional. Microlines. \$CALL

PANASONIC

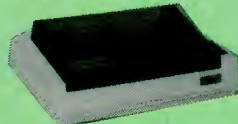
KX-P1090

The KX-P1090 (80 cps) features 10, 12, 17 cpi, italics, sub/super scripts, underlining, dot graphics plus some interesting print modes. It uses most Epson text code, so it should be easily installed on most word processing software. Quieter than most printers.

KX-P1090	\$349.88
----------	----------

STAR MICRONICS*

Gemini 10X/15 Delta 10/15



The Gemini 10X (120 cps) features 10, 12, 17 cpi, italics, a correspondence font, 120 x 144 dpi graphics matrix, a 1K buffer & friction/tractor feed. The Gemini 15 is the 132 column version.

Star's Delta 10 (160 cps) features parallel and RS-232C interfaces w/8K buffer, 10, 12 & 17 cpi, italics, dot graphics (120 x 144 dpi) & friction/tractor feed. The Delta 15 is a 136 column version.

Gemini 10X	\$299.88
Gemini 15	\$419.88
Delta 10	\$529.88
Delta 15	\$CALL

TOSHIBA

P1350

The P1350 (192 cps) features 132 columns, 10 & 12 cpi (plus double-width) & an exceptional near-letter quality font with proportional spacing. It has sub/superscripting features plus dot graphics (180 x 180 dpi). Parallel or RS-232C interface (specify).

P1350	\$1759.88
-------	-----------

LETTERQUALITY

C. ITOH

F10/A10 StarWriter PrintMaster



The C. Itoh F10 StarWriter (40 cps) uses Qume code, Diablo wheels & ribbons, 10 or 12 pitch, 6, 8 or 1/48" line space. The Printmaster has the same specs, but prints at 55 cps.

The A10 Starwriter also has the same specs, but it's slower (20 cps). The Tractor and Sheet Feeder work on all models.

F10 Starwriter	\$1219.88
A10 Starwriter	\$609.88
Printmaster Parallel	\$1569.88
Tractor Feed	\$289.88
Sheet Feeder	\$619.88

COMREX

CR-1	\$849.88
CR-1 Tractor	\$104.88
CR-2	\$509.88
CR-2 Tractor	\$94.88

DIABLO

620 (RS-232C)	\$999.88
630 (PC)	\$1979.88

NEC

Spinwriters

The new 2000 Series are slower (20 cps), but they've retained all the quality of the 3500/7700 Series. Uses the same thimbles & ribbons. 2010/2030. \$879.88

3530	\$1639.88
7710/7730	\$2159.88

SILVER REED

EXP-550/500



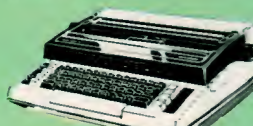
The Silver Reed EXP-550 (17 cps) is a 132 column letter-quality printer with 10, 12 or 15 pitch, sub/superscript, underlining and true Diablo 1610 emulation, making it compatible with most word processing software. It's friction fed, and it features a page injector; an optional tractor is also available.

The EXP-500 (12 cps) is a 100 column letter-quality printer with the same specs as the EXP-550, but slower and without page inject.

EXP-550 (Parallel)	\$669.88
EXP-550 Tractor	\$139.88
EXP-500 (Parallel)	\$439.88
EXP-500 Tractor	\$129.88
3 Wheel Set	\$49.88

SMITH-CORONA

Messenger*



The Memory Correct III Messenger (12 cps) is a daisy-wheel printer with a typewriter keyboard & parallel/RS-232C interface. 10.5" writing line (105 col); 10, 12 & 15 cpi, 6/8 line spacing, backspace/underline, sub/superscripts & auto-correct on. It comes complete with parallel/serial interface module.

Memory Correct III Messenger	\$599.88
------------------------------	----------

INTERACTIVE STRUCTURES

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The Pkaso is our interface card of choice. It's dedicated to a specific printer, which means you'll get to use all its features. Printers covered include the C. Itoh/NEC/Apple DMP, Epson MX/FX Series, Gemini 10X/15X, IDS Prism Series*, Okidata 80/90 Series & Centronics Series.

Pkaso Interface	\$139.88
*IDS Prism (Color)	\$159.88

ORANGE MICRO

Grappler +

Grappler	\$149.88
Bufferboard (16K)	\$149.88
Buffered Grappler	\$179.88

* indicates THE BOTTOM LINE Extended Warranty Plan is available for these printers. Call (603) 881-9855 for details.

struments educational toy that reads bar code and converts it to music and/or words. Who knows, you might even be able to sell singing commercials to your advertising accounts. The possibilities are limitless.

Ralph C. Moredock
4044 Leymoine Way
Campbell, CA 95008

Glamour vs. Good?

Hi. And congratulations. I think the magazine is improving, and I'm considering renewing my subscription. It sure would help if there were more about my Apple III, though.

I really get disgusted when new, cute and glamorous get all the press and good is ignored. There should be at least five times as many Apple IIIs in service now as there currently are—and a lot more software available, too—but there hasn't been much support by the press or by Apple...marketing experts they ain't.

Another gripe is that it took me five minutes to figure where to send this letter. How about putting the address at the top of the Letters page instead of six pages away.

Roger T. Harrier
Community Animal Hospital
833 North 12th Ave.
Pocatello, ID 83201

A New Twist

In some tips to economy-minded computer enthusiasts, I have often seen techniques for utilizing the unused half of a printer ribbon; this usually involves giving the ribbon a half-twist to invert the printing surface.

With such adhesives as Pentel Roll and Glue, it is possible to cut the fabric ribbon, give it a half-turn and glue the two ends back together. This creates a Mobius strip which automatically uses the upper and lower surfaces of the printer ribbon without further changing.

I have used this technique successfully with MX-80 and MX-100 printers.

Francis N. Fitzgerald
16 Forest St.
Middleton, MA 01949

A Fool-Proof Rip-Off Scheme

Some printers have a built-in tear bar that allows you to easily pull off a piece of tractor feed paper. And some, like mine, do not. I always had the problem of trying to tear the paper off and having it rip right down the middle. Well, no more. I discovered that an ordinary wire coat hanger makes a great tear bar. Just pass the end of the paper through the middle of the hanger before you start printing. When you're through printing, fold the perforation at the bottom of the last page around the straight wire of the hanger. Now grab the upper part of the hanger in one hand while grasping both ends of the paper in the other and gently pull. The hanger will neatly separate the paper at the perforation.

Richard Kramer
Riverdale, NY

Diskouraging

When opening a new box of disks, I always open the bottom flap and then tape it back up with the little flap sealed to the outside of the box. This precludes the possibility of damaging disks when you attempt to put ten back in the box at once; one always seems to hang up on that little flap, which ordinarily is tucked inside.

Carl C. Crell
110 Hilltop Road
Oxford, OH 45056

Too Many Epson Articles

I am a plastic surgeon and an amateur (but addicted) Apple IIe freak. My system uses a couple of disk drives and an Apple Dot Matrix Printer. We also have an Epson printer in one of our laboratories.

The Epson is a great printer—perhaps better than the Apple dot matrix—but *inCider* should consider publishing programs, tips or whatever directed towards Apple dot matrix users, rather than so much Epson-oriented material.

A. Griswold Bevin, M.D.
Route 4, Box 300
Chapel Hill, NC 27514

MONITORS

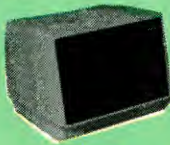
NEC

JB-1205M

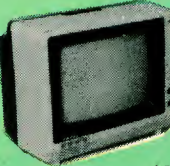


Slick design and specifications for an amber monitor. NEC's JB-1205M has an 18-20 MHz bandwidth and a crisp, clear amber display. Standard 80 column by 24 line (12" diagonal screen). The JB-1201 is the green screen version.
JB-1205M (amber).....\$179.88
JB-1201M (green).....\$169.88

AMDEK



300 (12" green).....\$149.88
300A (12" amber).....\$159.88



Color II+ (Com).....\$319.88

Modems

US ROBOTICS

Password



The Password is a direct connect originate/answer type modem with 0-300 & 1200 baud capability (Bell 212A compatible). Features auto dial/answer, auto mode/ speed select, full/half duplex (local echo), DTR override, RS-232C pins 2 & 3 reversible & audio phone line monitor. Comes with an RS-232C cable, power supply & modular cable. RS-232C interface for Apple II optional.
Password.....\$379.88

MPI

RS-232C Card.....\$99.88



DC HAYES

Micromodem IIe

The Micromodem IIe is an originate/answer, auto dial/answer, full/half duplex internal modem for the Apple/Franklin systems. It includes a communications package (Smartcom II), modem board, cables and complete documentation. A superior product.

Micromodem IIe.....\$259.88

Smartmodems

300 baud.....\$229.88
300/1200 baud.....\$539.88

NOVATION

AppleCat II

The AppleCat II is a 300 baud originate/answer, auto dial/answer, full/half duplex internal modem for the Apple/Franklin systems. A 1200 baud version is also available.

AppleCat II
300 baud.....\$319.88
1200 baud.....\$609.88

MICROSOFT

Softcard System

Microsoft's Softcard System includes Z80 Softcard for CP/M, Videx's Videoterm for 80 column display, a 16K RAMcard, software & Thom Hogan's book on CP/M. Premium Package.....\$474.88

If you've already got 64K RAM (Franklin or IIe), get the Z80/Softcard Combo. Same spec's, but without 16K RAMcard.
Z80/Videx Combo.....\$444.88

Z80 Softcard.....\$249.88
16K RAMcard.....\$69.88

SATURN/TITAN

Accelerator II

The Accelerator II's high-speed 6502 processor & 64K memory makes an Apple II run 3 1/2 times faster. Comes with pre-boot.
Accelerator II.....\$479.88

RAMboards by Saturn

32K Memory Board.....\$169.88
64K Memory Board.....\$269.88
128K Memory Board.....\$379.88

VIDEX

VideoTerm

The VideoTerm produces an 80-column display. Soft switch lets you toggle between 40 or 80 columns. Upper/lower case, CP/M & Pascal compatible.
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VideoTerm w/o switch.....\$209.88

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Apple keyboard enhancer: type-ahead buffer, repeat, shift/cap lock, programmable keys, full ASCII (upper/lower case).
Enhancer II.....\$109.88

RANA SYSTEMS

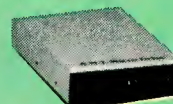
Elite-1

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Elite-2.....\$474.88
Elite-3.....\$614.88
Controller.....\$104.88

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AMT MicroDrive.....\$199.88

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 - We have a \$50 minimum order.
- Company Purchase Orders are accepted on a limited basis upon approval only. Sorry, no APO or foreign orders accepted.

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The Applesoft Adviser

by Dan Bishop

Hi-Res Page 2 Text

In this month's column, I will explain how you can use the mixed mode (graphics plus text mode) with page 2 of the Apple's hi-res graphics display. This information will be useful to you only if you can use hi-res page 2 (a minimum of 24K RAM) and have a need to use the mixed mode with hi-res page 2. Hi-res page 1 is far simpler to use with the mixed mode.

You might wish to use page 2 when your Basic program is so long that it spills into hi-res page 1 memory, rendering this area of memory unusable as a screen graphics display buffer. You also may wish to use page 2 when you need both page 1 and page 2 of hi-res graphics in order to accomplish your purposes, and both pages are in mixed mode.

The sample program provided with this article first appeared in an article I wrote for *Microcomputing* (July 1981, page 113) which also illustrates the techniques presented in this column.

Mixed Mode

By "mixed mode," I refer to the case in which a display's top 20 rows are used for graphics, while the bottom four rows are available for text display. Since the Apple does not easily lend itself to the mixing of text and graphics over the whole screen, many occasions arise when the use of mixed mode is essential.

The Basic commands GR and HGR both assume you want to use the mixed mode display (for lo-res or hi-res graphics respectively). Using either of these commands results in a mixed mode display using the page 1 buffers in memory. However, if you use the command HGR2, the resulting screen display uses all 24 rows for

System Buffers	0 - 1023	0000 - 03FF
Text page 1 & lo-res page 1	1024 - 2047	0400 - 07FF
Text page 2 & start of user Basic program storage.	2048 - 3071	0800 - BFFF
User Basic program storage (continued).	3072 - 8191	0C00 - 1FFF
Hi-res page 1 & user Basic program storage (continued).	8192 - 16383	2000 - 3FFF
Hi-res page 2 & user Basic program storage (continued).	16384 - 24575	4000 - 5FFF
User Basic program storage (continued).	24576 - 49151	6000 - BFFF
I/O and ROM	49152 - 65535	C000 - FFFF

Figure. Apple memory map showing locations of text page 1, lo-res page 1, text page 2, hi-res page 1 and hi-res page 2 memory buffers. Note that text page 2 also is used for storing the first lines of every Basic program.

graphics—leaving no room for on-screen text.

To understand why this is so, study the abbreviated Apple memory map shown in the Figure. Note that the memory buffer reserved for lo-res page 1 corresponds to the same area of memory reserved for the text page 1 display buffer. This means that when you list a program, the program information displayed on the screen is also stored in the text page 1 buffer area, character by character. It also means that if you are using lo-res page 1 in mixed

mode, the top five-sixths of this buffer area contains graphics information, and the bottom sixth contains any text to be displayed along the bottom four rows of the screen.

When you use hi-res page 1, you must reserve a much larger area of RAM for the buffer because more information must be stored for the hi-res screen. The Figure shows that

Address correspondence to Dan Bishop, c/o Custom Comp, PO Box 429, Buena Vista, CO 81211.

System Saver® didn't become the Apple's number one selling* peripheral by being just a fan.

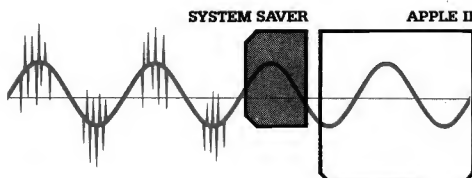
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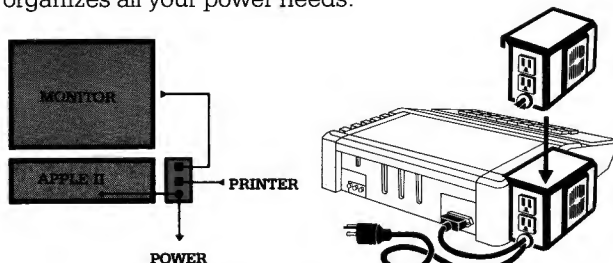
Power line noise can often be interpreted as data. This confuses your computer and produces system errors. Power surges and spikes can cause severe damage to your Apple's delicate circuitry and lead to costly servicing.

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System Saver makes your Apple more convenient to use.

No more reaching around to the back of your Apple to turn it on. No more fumbling for outlets and cords to plug in your monitor and printer. System Saver organizes all your power needs.

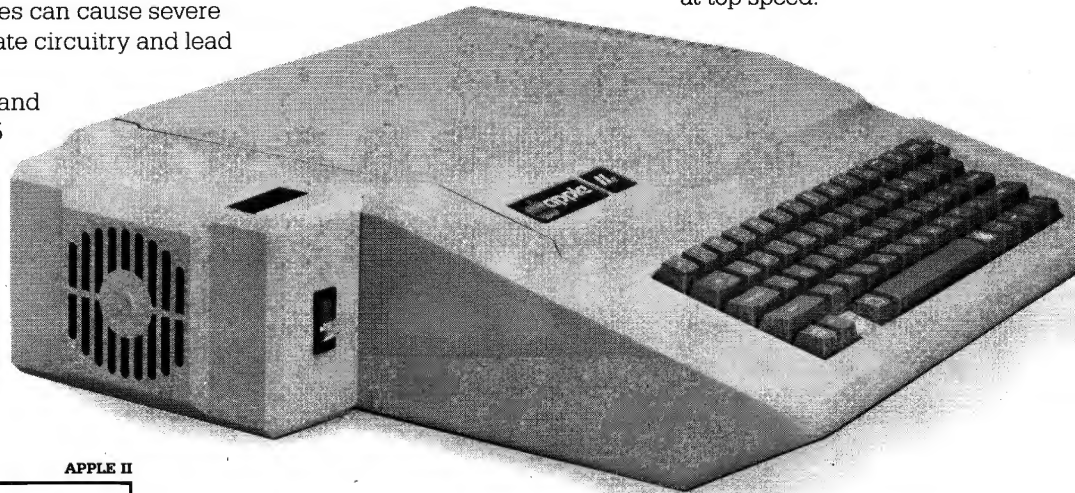
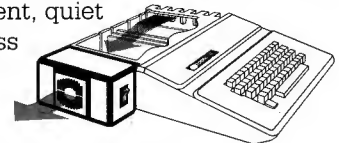


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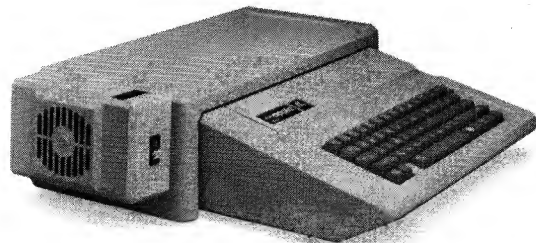
Today's advanced peripheral cards generate heat. In addition, the cards block any natural air flow through the Apple IIe creating high temperature conditions that shorten the life of the Apple and peripheral cards.

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Circle 86 on Reader Service card.

*Softset Computer Products Hot List. **PC Magazine: March 1983.

System Saver is UL Listed. System Saver's surge suppression circuitry conforms to IEEE specification 507 1980, Category A. Available in 220/240 Volts, 50/60 Hz.

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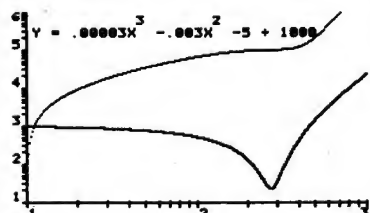
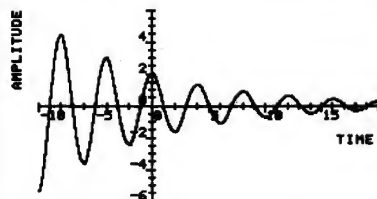
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Mixed Mode Text Line	Decimal Location	Hex Location	Insertion Location
Line one	2640 - 2679	0A50 - 0A77	0A4A
Line two	2768 - 2807	0AD0 - 0AF7	0ACA
Line three	2896 - 2935	0B50 - 0B77	0B4A
Line four	3024 - 3063	0BD0 - 0BF7	0BCA

Table. Areas of RAM used as buffer zones for the four lines of text displayed when hi-res page 2 graphics are being used in mixed mode. The decimal ranges shown provide the allowable values for FY. The maximums for each range give the value for FM when the sub-routines presented in this article are used.

```

90 J=LEN(AZ$)
92 IF FY<2680 THEN JJ=2680-FY: GOTO 100
94 IF FY<2808 THEN JJ=2808-FY: GOTO 100
96 IF FY<2936 THEN JJ=2936-FY: GOTO 100
98 JJ=3064-FY
100 IF J>JJ THEN J=JJ
102 FOR I=1 TO J
104 FX=0
106 Z#=MID$(AZ$,I,1)
108 IF ASC(Z#)<64 THEN FX=64
110 POKE FY, ASC(Z#)+FZ+FX
112 FY=FY+1
114 NEXT I
116 RETURN

```

Listing 1. This subroutine is used to poke the characters contained in AZ\$ into the text page 2 buffer zones for mixed mode display.

this area of RAM begins at memory address 8192 and extends all the way up to 16383. But the bottom four lines of the display, if you are using mixed mode, still come from text page 1, the same buffer area used by lo-res page 1 graphics. Since this area is not used for any other purpose, there is no conflict.

Now note where the text page 2 buffer appears on the memory map. The text page 2 buffer occupies the identical region of RAM that your first batch of Basic program lines uses. Hi-res page 2 uses RAM locations 16384 through 24575. If hi-res page 2 were to be displayed in mixed mode, it would use five-sixths of this RAM space to provide a buffer for the top 20 lines of the display, and would use a part of text page 2 to store the four lines of text.

But wait a minute! Since your Basic program also uses the text page 2 buffer, any attempt to store information into this buffer for screen display will clobber the Basic instructions stored there! It would appear that hi-res page 2 must forever be used as a full-screen graphics display. Mixed mode must be out of

the question.

At least these were the conclusions I had until I ran across a cryptic remark on page 88 of my Applesoft manual. This page pointed out that by using a POKE -16301,0 command just after an HGR2 command, you could convert full screen graphics for hi-res page 2 into mixed mode. However, the manual goes on to state that "...the four lines of text are taken from page 2 of text, which is not easily accessible to the user." The manual did not say that the job couldn't be done—merely that it would present somewhat of a challenge!

The Challenge

The solution, though simple to comprehend, is difficult to implement. If some part of RAM used by the Basic program must also be used by the screen text buffer, those specific bytes need to be reserved for the text buffer so that their presence in the program itself will be ignored. One way to do this is to isolate those specific bytes within the quotation marks of a PRINT statement. So long as the program skips over these

PRINT statements, they will not cause any problems.

The Table lists the memory locations used by each of the four text lines within hi-res page 2. Of course, each zone is 40 bytes long. If you could design your Basic program so that each 40-byte zone would correspond to 40 blanks in a PRINT statement, the Basic interpreter would simply bypass these PRINT statements without regard to their contents. Then, when you wished to display information on the bottom four lines of a hi-res page 2 display, you could POKE the appropriate information into these reserved zones and it would be ready for display with a simple HGR2: POKE -16301,0 command to switch the display to mixed mode.

Sounds simple, doesn't it? You may have felt a little uneasy when reviewing the Table and finding the

memory addresses shown in hexadecimal as well as in decimal. If so, hang on tightly! Those hex addresses are very important. To tailor your Basic program to accommodate the four PRINT lines, you must use the program monitor and deal with hexadecimal. But before worrying about that, first enter the first 1200 bytes (more or less) of your Basic program exactly as you want them to appear in the final copy. Any changes in this segment of your program after fitting in the PRINT statements may result in disaster!

With the first 1200 bytes or so entered into the Apple's memory, execute a CALL -151 to enter the system monitor program. Using the monitor program, you must find the Basic program line number for the program line that runs through memory location hex -0A4A, which is six bytes before hex -0A50 (refer to

the Table). Your first PRINT zone instruction line must be placed directly before this program line, and it must provide enough blanks to push this program line past hex -0A78 (refer again to the Table). The following five steps may be used to accomplish this task.

1. Enter CALL -151 and then enter 0A00 as the starting memory address to be scanned. Carefully scroll through the resulting memory dump by repeatedly pressing the return key. Look for a hex -00 byte which tells you where a Basic program line has ended. When you find a hex -00, look at the next two bytes, which give the location of the program line that follows that one you are about to read. (Since address pairs are stored in memory in reverse order, address 0A4A will appear as 4A 0A.) If these two bytes are less than

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0A4A, then proceed to the next hex -00 to appear in the memory dump. As soon as you find a "next-line" pointer that points beyond 0A4A, you have found the Basic program line that must be pushed back to make room for your first reserved PRINT zone. Analyze the next pair of bytes and convert them to a decimal number (remember to reverse their order). This will correspond to a Basic sequence line number in your program.

2. Determine how many bytes you must reserve to get from this point in RAM to the end of the first line's reserved space, 0A78. Be sure to count in hex! This value will correspond to the number of blank spaces to reserve between the quotation marks in the PRINT statement.

3. Return to Basic command mode by pressing the reset key, and insert your PRINT line along with the appropriate number of blanks (within quotation marks) immediately ahead of the program line identified in step 1.

4. Return to the monitor mode and scan from 0A50 to 0A78 to verify that all 40 bytes are filled with 20s, the ASCII code for the space character (hex -20 equals decimal -32).

5. Follow the exact procedure for the remaining three reserved zones. For the second line, you must look for a "next-line" pointer that exceeds 0ACA; for the third, 0B4A; and for the fourth, 0BCA. Use the Table to arrive at your byte count and to verify that the appropriate spaces have been set aside as blanks.

In your Basic program, you now have four new PRINT statements that

reserve one line each in text page 2 to be used with hi-res page 2 in mixed mode. When you use these reserved areas, you will be poking characters into them that will correspond to the characters you wish to have displayed on the screen. The only remaining task is to return all bytes in these zones to blanks before the program ends. If this is not done, you will see some very strange coding should you end the program and then list or save it. The following sequence of code should appear just before the END statement in your program:

```
FOR I=0 TO 39
```

```
POKE 2640 + I, 32
```

```
POKE 2768 + I, 32
```

```
POKE 2896 + I, 32
```

```
POKE 3024 + I, 32
```

```
NEXT I
```

This loop will replace with blanks any characters poked into the reserved zones, thereby restoring the program to its original condition.

For Example...

Suppose you have written the first 1200 bytes of your Basic program. You then enter CALL -151 and are in the monitor mode looking for 00 in the memory dump. Suppose you find a 00 at memory location 0A1F. The next two bytes are 3A 0A. Reverse the order of these two bytes to obtain 0A3A. Since this is not larger than 0A4A, you must proceed through the dump to the next 00 byte (which, of course, appears at 0A39). From that point, the next two bytes are 4D 0A, which becomes 0A4D when reversed. This value is larger than 0A4A, so this line of code corresponds to the program line that must be pushed back to make room

Listing 2. A flower garden. This program demonstrates the techniques presented in this article. Lines 1 through 116 must be reproduced exactly as shown, including remarks and blanks. To get the program to work properly, you may have to add or remove a few blanks from the PRINT statement in line 16.

```
1 REM FLOWER GARDEN
2 REM DEMONSTRATION
3 REM OF HIRES-PAGE2
4 REM GRAPHICS IN
5 REM MIXED MODE
```

Listing continued.

hard ware

for the PRINT statement reserving the first zone.

The next two bytes contain C2 01. Reversing the order gives 01C2. Converting this number to decimal gives us the number 450 (1×256 plus 12×16 plus 2). This identifies the line which will be pushed back by the insertion of the PRINT statement as line 449.

Before leaving the monitor mode, however, you must also determine how many blanks that PRINT statement needs to adequately cover the range from 0A39 to 0A78. Counting in hex from 39 to 78 reveals that 62 blanks will be more than enough to reserve the needed text buffer zone.

Finally, return to Basic and enter:

```
449 PRINT"
```

being sure to place 62 blanks between the quotation marks. You have reserved in text page 2 the first text buffer zone, which is available for any text you wish to enter on the first text row when using hi-res page 2 in mixed mode.

Poking Text

Listing 1 presents the subroutine used for poking the desired text information into the four text display zones reserved by your four new PRINT statements. The subroutine variable FZ lets you specify whether you wish text to appear in normal, flashing or inverse mode. If FZ = 0, the text will appear in flashing mode. If FZ = 128, it will be in normal mode, and if FZ = -64, it will be in inverse mode.

Set the value for FY *before* using this subroutine. FY specifies the location where poking is to begin, and FY must have a value that falls within the decimal ranges shown in the Table. The subroutine does not check to be sure that you, the programmer, have chosen a proper value for FY, so be careful. If you are not, you may end up clobbering your program.

Finally, you must assign the character string you want displayed to the string variable AZ\$. You need not worry about whether the string may be too long to fit in the zone specified. The subroutine checks this fac-



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Listing continued.

```

10 LOMEM:24600
12 REM BZ$ HAS TWENTY BLANK SPACES
14 BZ$=""
16 PRINT"                                     ":REM 31 BLANKS
18 GOTO 1000

20 ROT=0
22 SCALE=SC
24 FOR I=1 TO 4
26 DRAW 1 AT X,Y
28 ROT=15*I
30 NEXT I
32 RETURN

40 POKE 232, 04
42 POKE 233, 96
44 DATA 1,0,4,0,46,46,46
46 DATA 44,44,36,39
48 DATA 39,55,55,55,00

50 FOR I=1 TO 16
52 READ A
54 POKE 24579+I, A
56 NEXT I
58 RETURN

60 Y=INT(L/200)
62 X=L-(200*Y)+39
64 Y=Y+20
66 RETURN

70 HCOLOR=1
72 HPLOT 37,19 TO 239,19 TO 239,140 TO 37,140 TO 37,19
74 RETURN

80 FOR I=1 TO 5000:NEXT I:RETURN

90 J=LEN(AZ$)
91 PRINT"                                     ":REM 60 BLANK SPACES
92 IF FY<2680 THEN JJ=2680-FY:GOTO 100
94 IF FY<2808 THEN JJ=2808-FY:GOTO 100
95 PRINT"                                     ":REM 50 BLANKS
96 IF FY<2936 THEN JJ=2936-FY:GOTO 100
98 JJ=3064-FY

100 IF J>JJ THEN J=JJ
101 PRINT"                                     ":REM 50 BLANKS
102 FOR I=1 TO J
104 FX=0
106 Z$=MID$(AZ$,I,1)
107 PRINT"                                     ":REM 70 BLANKS
108 IF ASC(Z$)<64 THEN FX=64

110 POKE FY, ASC(Z$)+FZ+FX
112 FY=FY+1
114 NEXT I
116 RETURN

200 N$=""
202 GET AZ$
204 IF ASC(AZ$)=13 THEN RETURN
206 IF ASC(AZ$)=8 THEN GOTO 216
208 GOSUB 90

210 N$=N$+AZ$
212 IF FY<FM THEN GOTO 202
214 RETURN
216 AZ$="" :FY=FY-1
218 N$=LEFT$(N$,LEN(N$)-1)

```

Listing continued.

Soft ware

tor and will print only as many characters from AZ\$ as will fit on the screen.

A word of warning is needed here. It is generally good practice to save a program to disk before testing it. When the program is run, it will be modifying its own code, so it could be all too easy for a minor error to totally destroy the program. When working with these techniques, always save your program before running it! Precious hours could be saved.

A Demonstration Program

Listing 2 is a short program that demonstrates these techniques. This program, A Flower Garden, not only uses AZ\$ to display text strings onto the hi-res page 2 text window, but also variables and information entered at the keyboard.

Lines 90 through 116 from Listing 1 also appear in Listing 2, with four notable additions. Line 91 had to be inserted before line 92, because this location in RAM corresponded to the first PRINT zone buffer area. Similarly, lines 95, 101 and 107 have been added to provide for the other three PRINT zone buffers.

When entering this program, be sure to copy the listing *exactly*, particularly from line 1 through line 116. Any variation in this part of the program will offset the PRINT zone buffers and may have you poking text into part of your Basic program instructions!

Line 16 in this program contains a series of 31 blanks. When using the techniques described in this article, it is useful to include such a dummy print instruction at the outset of the program. Then, if it becomes necessary to add or change code in the Basic program at some point before the PRINT zone buffers, blanks in line 16 can be removed or added. This will keep your PRINT zone buffers located exactly where they are needed.

The main program begins at line 1000. The subroutine beginning at line 40 sets up a simple shape table used for drawing the flowers on the display. The subroutine at line 70 plots the fence around the garden,



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Listing continued.

220 GOSUB 90
222 FY=FY-1
224 GOTO 202

300 FOR I=0 TO 39
302 POKE 2640+I, FZ
304 POKE 2768+I, FZ
306 POKE 2896+I, FZ
308 POKE 3024+I, FZ

310 NEXT I
312 RETURN

1000 GOSUB 40
1005 HGR2
1010 GOSUB 70
1015 HCOLOR=2
1020 POKE -16301,0
1025 AZ\$="WHAT IS YOUR NAME"
1030 FY=2650:FZ=128

1035 GOSUB 90
1040 AZ\$="?:FZ=0:GOSUB 90
1045 FY=2780:FM=2807
1050 FZ=-64:GOSUB 200
1055 AZ\$="I AM GLAD TO MEET YOU "+N\$
1060 FY=3024:FZ=0
1065 GOSUB 90:GOSUB 80
1070 AZ\$=BZ\$+BZ\$
1075 FY=2640:FZ=0
1080 GOSUB 90
1085 FY=3024:GOSUB 90:GOSUB 80
1090 FY=2768:FZ=128:GOSUB 90
1095 N=0

1100 AZ\$="THE GARDEN HAS 24000 LOCATIONS."
1105 FY=2640:FZ=-64:GOSUB 90
1110 N=N+1
1115 AZ\$="WHERE DO YOU WANT FLOWER #"+STR\$(N)+"?"
1120 FY=2768:FZ=128:GOSUB 90
1125 FY=2896:FZ=0:FM=2935
1130 GOSUB 200
1135 L=VAL(N\$)
1140 IF L<0 OR L>24000 THEN FZ=128:GOSUB300:GOTO1100
1145 AZ\$="WHAT SIZE FLOWER?"
1150 FY=3024:FZ=128:GOSUB 90
1155 FY=3042:FZ=0
1160 AZ\$="S.....L"
1165 GOSUB 90
1170 AZ\$="MALL/"
1175 FY=3043:FZ=128:GOSUB 90
1180 AZ\$="ARGE?"
1185 FY=3049:GOSUB90
1190 FZ=0: GOSUB 200

1195 SC\$ = LEFT\$(AZ\$,1):SC = 2
1200 IF SC\$ = "S" THEN SC = 1: GOTO 1210
1205 IF SC\$ < > "L" THEN GOTO 1145
1210 GOSUB 60: GOSUB 20
1215 GOSUB 1270
1220 AZ\$ = "DO YOU WANT TO PLANT ANOTHER?"
1225 FY = 2640:FZ = 128: GOSUB 90
1230 AZ\$ = "Y/N"
1235 FY = 2780:FZ = 0: GOSUB 90
1240 FZ = - 64:FM = 2679: GOSUB 200
1245 R\$ = LEFT\$(N\$,1)
1250 IF R\$ = "Y" THEN GOTO 1100
1255 IF R\$ < > "N" THEN GOTO 1220
1260 FZ = 32: GOSUB 300
1265 HOME : TEXT : END
1270 AZ\$ = RZ\$ + BZ\$
1275 FY = 2896:FZ = 0: GOSUB 90
1280 FY = 3024: GOSUB 90
1285 FY = 2760: GOSUB 90
1290 RETURN

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by Bill O'Brien

Why?

Come on to my house," said a friend of mine. "Why?" I asked the question having become suspicious of human nature. "I want you to show me how to convert Apple II graphics to my Apple III." There was, after all, a catch. Life is, after all, plagued with ulterior motives. Luckily, I had all of the tools I needed already on my person. I agreed.

I sat down in front of the Apple III, turned everything on, and when all of the loading messages had finished, reached into my pocket. I withdrew five crayons and began to rapidly smear them on to the screen of the Monitor III.

"Hey! What are you doing?" was the question naturally raised. I had expected it. "I'm just doing what you asked. In hi-res mode the Apple II can do exactly what I'm doing now."

And I showed my friend Listing 1.

"Why," I asked, putting down my artistic implements, "would you want to do *that* to an Apple III?" The reply: "All of those great graphics programs on the II..." "Think of it this way, you can poke values onto the Apple II screen, which you can't do on the III, but look, hi-res page one (of two) starts at &H2000 (hexadecimal 2000). It goes down a few screen lines to &H2380 and then skips back to &H2028. All in all, it's a pretty confusing system. You should have seen the consternation it caused Apple II users when they first found out about it.

"And lo-res graphics aren't much better, it's just a bunch of boxes! Why do you want to do that to a III? Tell you what, let's go buy a 944 and we'll strip the engine out. Then we can put

a VW engine in there instead and bolt on all that great stuff they've got for VW's.

"Better still, why don't you just run the Apple II programs in emulation mode the way it was meant to be done? Or if you've got to see what they'd look like on an Apple III, contact the folks at the International Apple Core, 908 George St., Santa Clara, CA 95050. I haven't seen it, but they supposedly have a program called Apple-CON that converts Applesoft programs to Business Basic. Give them a call at 408-727-7652 and find out what, if anything, it can do for graphics.

"Think of it this way, though. On an Apple II, if you want to set a screen size, you do it according to the rules in Listing 2a. If you're doing that on an Apple III, all you need to use is the statement in Listing 2b. Why complicate your life?

"And for direct screen manipulation! Simplicity, thy name is Apple III! Take a minute and type in the program in Listing 3. You can move things around without having to re-

1. Hi-res is 280 X 192 dots
2. Each dot on the screen represents one bit from from the picture buffer.
3. Seven of the eight bits are displayed on the screen with the eighth bit used to select the colors of the dots in that byte.
4. If a bit is "off" its corresponding dot will be black.
5. If a bit is "on" and in the leftmost column of the screen or in any even numbered column, then it is violet.
6. If a bit is "on" and in the rightmost column of the screen or in any odd numbered column, then it is green.
7. If two dots are placed side by side, then they will both appear white.
8. If the undisplayed bit of a byte is turned "on" then the colors blue and red are substituted for violet and green respectively.
9. It is not possible to mix green and blue, green and red, violet and blue or violet and red in the same byte.

Listing 1. The rules for Apple II hi-res graphics.

1. Black
2. Violet
3. Blue
4. Black
5. Green
6. Red

Table 1. The "six" colors available in Apple II hi-res mode.

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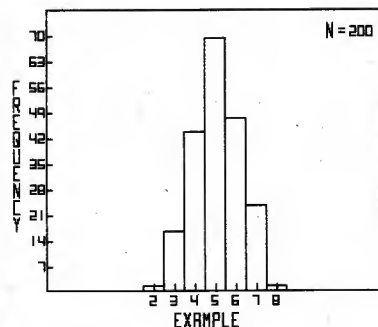
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Listing 3. Apple II screen manipulation.

```

10  /
    *****
    *
    *   THE   PROGRAM   *
    *
    *****

15  GOSUB 30000
20  E$=FULL.SCREEN$+CLEAR.SCREEN$
25  PRINT FULL.SCREEN$;CLEAR.SCREEN$;
30  PRINT CURSOR.OFF$;
35  PRINT INVERSE.ON$;
40  PRINT CLEAR.SCREEN$;
45  PRINT INVERSE.OFF$;
50  COL=1:ROW=1:GOSUB 30115:PRINT UPPER.LEFT$;
55  COL=77:ROW=21:GOSUB 30115:PRINT LOWER.RIGHT$;
60  PRINT CLEAR.SCREEN$;
65  GOSUB 30200
70  PRINT CURSOR.OFF$;
75  :
80  :
100 /

    *****
    *
    *   CHAIN NEXT PROGRAM   *
    *
    *****

105 GOTO 105
30000 /

    *****
    *
    *   DEFINITIONS   *
    *
    *****

30005 CLEAR.SCREEN$=CHR$(28)
30010 CLEAR.END.LINE$=CHR$(31)
30015 HOME.CURSOR$=CHR$(12)
30020 CLEAR.END.SCREEN$=CHR$(29)
30025 INVERSE.ON$=CHR$(18)
30030 INVERSE.OFF$=CHR$(17)
30035 CURSOR.LEFT$=CHR$(8)
30040 CURSOR.RIGHT$=CHR$(9)
30045 CURSOR.UP$=CHR$(11)
30050 CURSOR.DOWN$=CHR$(10)
30055 SCREEN.ON$=CHR$(15)
30060 SCREEN.OFF$=CHR$(14)
30065 CLEAR.LINE$=CHR$(30)
30070 BELL$=CHR$(7)
30075 UPPER.LEFT$=CHR$(2)
30080 LOWER.RIGHT$=CHR$(3)
30085 FULL.SCREEN$=CHR$(4)
30090 CURSOR.ON$=CHR$(5)
30095 CURSOR.OFF$=CHR$(6)
30099 RETURN
30100 /

    *****
    *
    *   PROCEDURES   *
    *
    *****

30105 PRINT CHR$(19);CHR$(COLOR);:
      RETURN:
      / SET FOREGROUND COLOR
30110 PRINT CHR$(20);CHR$(COLOR);:
      RETURN:
      / SET BACKGROUND COLOR
30115 PRINT CHR$(26);CHR$(COL);CHR$(ROW);:
      RETURN:
      / CURSOR POSITIONING
30120 PRINT CHR$(16);CHR$(MODE);:
      RETURN:
      / TEXT MODE (0=40X24 B&W, 1=40X24 COLOR, 2=80X24 B&W)
30125 PRINT CHR$(23);CHR$(SHIFT);:
      RETURN:
      / HORIZONTAL SHIFT (1=1 RIGHT, 255=1 LEFT)

30200 /

    *****
    *
    *   LOGO   *
    *
    *****

30205 LOGO$(1)=" . . . . .
30210 LOGO$(2)=" . . . . .
30215 LOGO$(3)=" . . . . .
30220 LOGO$(4)=" . . . . .
30225 LOGO$(5)=" . . . . .
30230 LOGO$(6)=" . . . . .
30235 LOGO$(7)=" . . . . .
30240 :
30245 FOR X=1 TO 7
30250 IF X=1 THEN GOSUB 30400:
      ELSE IF X=4 THEN GOSUB 30440:
      ELSE IF X=5 THEN GOSUB 30455
30255 FOR Y=1 TO LEN(LOGO$(X))
30260 IF MID$(LOGO$(X),Y,1)="#" THEN PRINT INVERSE.ON$;" ";INVERSE.OFF$;:
      ELSE PRINT " ";

```

Listing continued.

paint the screen, without having to go through complicated processes. And it's all done in Basic, not machine language."

"If you PRINT CHR\$(23);CHR\$(1);, the entire video display will shift to the right one row. PRINT CHR\$(23);CHR\$(255) will do the same, only the shift is left. It is not an erase and repaint of the display, but a genuine shift that is almost flicker-free. Up and down motion is simply a matter of placing the cursor on the top or bottom lines of the display and printing the up or down arrow characters (CHR\$(11) and CHR\$(10), respectively). By using the WINDOW command to partition the display areas, near animation can be achieved."

"Gee," was about the only answer. It was more than I expected, actually. The rest of the evening passed

without reportable incident.

What's Happening

As of this date, with its usual and unavoidable publication delays, nothing special has been released by Apple vis a vis a new version of the Apple III. Rumors abound, but as usual, they are unconfirmed (such being the nature of rumors). If anything, Apple seems to be putting a new emphasis on the III. Just released is a small booklet called *Will Someone Please Tell Me What an Apple III Can Do*. It's a 95-page listing of Apple III software available both in the United States and Great Britain. While some of the programs listed need the SoftCard III (Wordstar III and dBase II to name two prominent examples), the majority are SOS compatible. Get a copy, this

Listing continued.

```

30265 NEXT Y
30270 PRINT
30275 NEXT X
30300 '
*****
*
*   MOVE THE SCREEN
*
*****

30305 GOSUB 30400
30310 FOR X=1 TO 8:PRINT CURSOR.UP*;;NEXT X
30315 FOR X=1 TO 10:SHIFT=1:GOSUB 30125:NEXT
30320 GOSUB 30455
30325 FOR X=1 TO 17:SHIFT=1:GOSUB 30125:NEXT
30330 COL=1:ROW=21:GOSUB 30115
30335 FOR X=1 TO 5:PRINT CURSOR.DOWN*;;NEXT
30340 PRINT FULL.SCREEN*;;
30345 COL=1:ROW=12:GOSUB 30115
30350 PRINT UPPER.LEFT*;;
30355 COL=76:ROW=10:GOSUB 30115
30360 PRINT LOWER.RIGHT*;;
30365 FOR X=1 TO 7:SHIFT=255:GOSUB 30125:NEXT
30370 '
30375 PRINT FULL.SCREEN*;;
30380 COL=18:ROW=16:GOSUB 30115
30385 PRINT "Productivity and Economy Working Together";
30390 '
30395 RETURN
30400 '
*****
*
*   DIVIDE SCREEN
*
*****

30405 PRINT FULL.SCREEN*;;
30410 COL=1:ROW=1:GOSUB 30115
30415 PRINT UPPER.LEFT*;;
30420 COL=77:ROW=10:GOSUB 30115
30425 PRINT LOWER.RIGHT*;;
30430 COL=0:ROW=0:GOSUB 30115
30435 RETURN
30440 PRINT FULL.SCREEN*;;
30445 COL=18:ROW=12:GOSUB 30115
30450 RETURN
30455 PRINT FULL.SCREEN*;;
30460 COL=1:ROW=13:GOSUB 30115
30465 PRINT UPPER.LEFT*;;
30470 COL=76:ROW=8:GOSUB 30115
30475 PRINT LOWER.RIGHT*;;
30480 COL=0:ROW=6:GOSUB 30115
30485 RETURN

```



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is not a request.

I have been blessed with a WordStar 3.3 Professional package, finally. Unfortunately, the copy MicroPro sent me did not include an Apple III on the installation menu. Although the documentation states that all arrow keys are functional and, additionally, the numeric keypad can be used for control functions, verifying this will have to wait until I can send the disk back and get a correct copy. News as it happens.

Treasure

One of the programs I found in the Apple III software guide is called *Programmer's Power Tools III* by CE Software, 801 73rd St., Des Moines, IA 50312. When I first heard the name I was a bit skeptical. Raised in a consumer environment, the words "new," "improved" or "power" always lead to questions of veracity. Nevertheless, I wrote to CE and they sent me back two pieces of software. One I thought was incredible. It's called Invisicalc. Supplied in 5¼ inch jacket format, the package comes with complete documentation and is both Apple II and III compatible (in fact, it will fit in any drive with a 5¼ inch opening). It's one of the few totally bug-free things I've seen that fully lives up to all that the documentation claims. As the package promises, "Why say 'what if' when you can say 'who cares.'" For those of us who celebrate the arrival of April, it makes an excellent gift.

The other package, Programmer's

Power Tools, was, if at all possible, better and more down to Earth. All along, whenever I've used a Basic program as an example, I've included a procedures section to handle various screen functions and input routines. Believe it or not, PPT takes away any reason to have such procedures and uses two invocable modules to handle everything.

If you wanted to code a series of inputs for some form of database (any information-gathering routine is a database), you could go through a whole rigamarole of programming procedures defining variable length, printing the prompt, setting screen location, defining the length of the response, etc. Rather, with PPT you use a section of your program, like Listing 4, that defines the prompt string, the length of the response and the column and row positions. Then, after invoking the PPT modules, start a FOR...NEXT loop that sends program execution to a line similar to this:

```
X = EXFN%.TEXTGET(@PROMPT$
(NUM),%LENGTH%(NUM),%CON
TROL%,%ROW%(NUM),%COL%(NUM))
where the invoked function is TEXT
GET, PROMPT$(NUM) is your prompt
for the data, LENGTH%(NUM) is the
required response length, ROW%(NUM)
and COL%(NUM) are the screen posi-
tion, leaving us only with the myster-
ious CONTROL%. Look over at Table
2—it's a partial list of the control
functions available through PPT.
```

Once your prompt has been printed at the desired screen location, it still remains for you to get the data in. The CONTROL% number sets the parameters for the entry of that data. It gives us a choice of several keys to use as "fast outs" (keys which, when pressed, will stop entry and return to the main program). The X value at the beginning of the line reports if any of these keys are pressed by being assigned its ASCII value. By adding

to the control number, you can print an underline the same length as the expected response length or format the decimal places allowed in numeric input.

How often have you looked for a Yes or No response in a program and coded for both uppercase and lowercase characters? By inputting the character(s) in a variable and then using:

```
PERFORM UCASE(@variable$)
```

a "y" response becomes "Y" or a longer entry (say, of a name like "Fred Fern") becomes FRED FERN. No other coding is necessary.

Imagine that you want a date. There is a DATEGET function that will print the _/_/_ format and check for valid month and day entries (to a maximum entry of 12 for month and 31 for days, but no checking for valid day-to-month correspondence as would happen with February and day 29).

Have you ever had someone hit the reset button during a disk write and wipe out a perfectly good database? PPT also contains a RESETON/RESETOFF call that enables/disables the control-reset sequence.

Lastly, those of you who have read this column with any regularity know that I have always lamented the inability to format disks without using the System Utilities Disk, a process that meant leaving the current facilities altogether. PPT also has a call to format a disk. X=EXFN%.FORMAT(@NAME\$) will format a disk in the drive and with the volume name contained in the variable NAME\$ (i.e., NAME\$="Dn/VOLUMENAME", where n is the drive number). In this case, X returns an error number if there was a problem while formatting (write protect, etc.).

There are some reservations, however. First, the Apple format driver, FMTDX.DRIVER, must be resident in the SOS.DRIVER file on the boot disk. Second, there is no checking (error or otherwise) of the routine as it performs. That means that if you've placed a valuable disk that you really don't want formatted in the drive you've selected you are now out one valuable disk. Also, the validity of the

```
10 POKE 32,LEFT
20 POKE 33,WIDTH
30 POKE 34,TOP
40 POKE 35,BOTTOM
```

Listing 2a. Setting the display window on the Apple II.

```
10 WINDOW START.COLUMN,START.ROW TO END.COLUMN,END.ROW
```

Listing 2b. Setting the display window on the Apple III.



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volume name is left to your discretion. It is possible to create a disk with a volume name that cannot be referred to under normal SOS operations. Using that function would require a little bit of external coding to determine both the propriety of names and the physical characteristics of the disk. Even so, its availability is a thing to be applauded most strenuously.

I have yet to mention the search and sort routines that are performable, and will leave them to your own discovery upon purchasing the package. Let it suffice to say that Programmers' Power Tools III is the most relevant piece of utility software I have yet seen for Business Basic programmers. My understanding is that the invocable modules are available for license and anyone seriously con-

sidering Basic programming on the III would be well advised to contact CE Software. At \$79.95 it will probably pay for itself in the first two hours of use. (P.S., this is probably the strongest recommendation I've ever given anything.)

Commentary

It's often very difficult to say "no" to someone, more difficult still if it's a good friend or a business associate. When the subject is software, and everyone these days (on the user side, at least) seems to be so apathetic about it, sometimes it's easier to just go along and say "Sure, here's a copy." There are times when it seems on the up and up. It might happen that the puppy decided to spare data disks but of course attacked the not-yet-backed-up original disk. You fall vic-

tim to the "I really need to use that software, can you give me a copy until I get mine fixed."

It seems harmless, right? I mean, on that level, it should be perfectly correct to duplicate copyrighted software and extend a courtesy to a friend. Or maybe you're a retailer and your best customer came in with the same story? They did buy it from you originally. Certainly, it must be all right. What about the mechanism behind that? Here's your friend (or customer) who didn't bother to protect what is admittedly a valuable piece of software and you are compounding that negligence. Of course, you're also putting yourself up for a hefty dollar fine, but nobody ever catches the little guys so that makes it all right. Did you ever think of calling up the software manufacturer and finding out how they feel about it? Given the above situation, they might even be agreeable to the loan, providing you could supply valid serial numbers for both disks. With their blessing, you remove yourself from any liability. Without it, you're trying to add two acts of stupidity together and come up with intelligence. You'd have better luck trying the government.

Forget the morality, the ethics, forget the legality of copying software. Morals, ethics, the law, they are all abstracts that constantly give ground to debate. Stupidity, on the other hand, has been a finely developed art, practiced from the inception of the human race. If you can once rationalize stupidity under a given set of circumstances, it becomes much easier later on to rationalize it again, and again. Personally, I can certainly survive someone calling me immoral, or unethical, for that matter. I can live through the "stigma" of illegality. But I'll be hanged for a buck-toothed bear if I'd want someone to think I was stupid. Think about it for a while.

In the meantime, Valentine's Day will soon arrive. Remember to tell someone you love that you do. The words are important. For the time being, live long and program.

Ciao bene, AppleAmerica. ■

Value	Operation
0	No fast outs
1	Use ESCAPE as a fast out (X returns 27)
2	Use RETURN as a fast out (X returns 13)
4	Use LEFT-ARROW as a fast out (X returns 8)
8	Use RIGHT-ARROW as a fast out (X returns 21)
16	Use TAB as a fast out (X returns 9)
32	Use UP-ARROW as a fast out (X returns 11)
64	Use DOWN-ARROW as a fast out (X returns 10)
128	Use OPEN-APPLE keys as a fast out (X returns value of key pressed)
1024	Print the underline characters describing the length of the response immediately, even if fast outs are in effect.
8192	Ignore all characters in the Apple III type-ahead buffer.
16384	Convert the Apple III keyboard to OPEN-APPLE keys.

Table 2. Partial list of control codes.

```

1400 REM
1410 REM *****
1420 REM *
1430 REM * SCREEN *
1440 REM * PROMPTS *
1450 REM *
1460 REM *****
1470 REM
1480 PROMPT$(1)="CUSTOMER NAME:":LENGTH$(1)=35:COL$(1)=1:ROW$(1)=6
1490 PROMPT$(2)="ADDRESS #1:":LENGTH$(2)=30:COL$(2)=4:ROW$(2)=7
1500 PROMPT$(3)="ADDRESS #2:":LENGTH$(3)=30:COL$(3)=4:ROW$(3)=8
1510 PROMPT$(4)="CITY:":LENGTH$(4)=25:COL$(4)=10:ROW$(4)=9
1520 PROMPT$(5)="STATE:":LENGTH$(5)=2:COL$(5)=45:ROW$(5)=9
1530 PROMPT$(6)="ZIP:":LENGTH$(6)=9:COL$(6)=58:ROW$(6)=9
1540 PROMPT$(7)="CONTACT:":LENGTH$(7)=30:COL$(7)=7:ROW$(7)=10
1550 PROMPT$(8)="CUSTOMER CODE:":LENGTH$(8)=5:COL$(8)=1:ROW$(8)=5
1560 PROMPT$(9)="PHONE:":LENGTH$(9)=14:COL$(9)=9:ROW$(9)=11
1570 FOR P=0 TO 9
1580 PROMPT$(P)=CHR$(18)+PROMPT$(P)+CHR$(17)+" "
1590 NEXT P
1600 RETURN

```

Listing 4. Defining values for PPT III.

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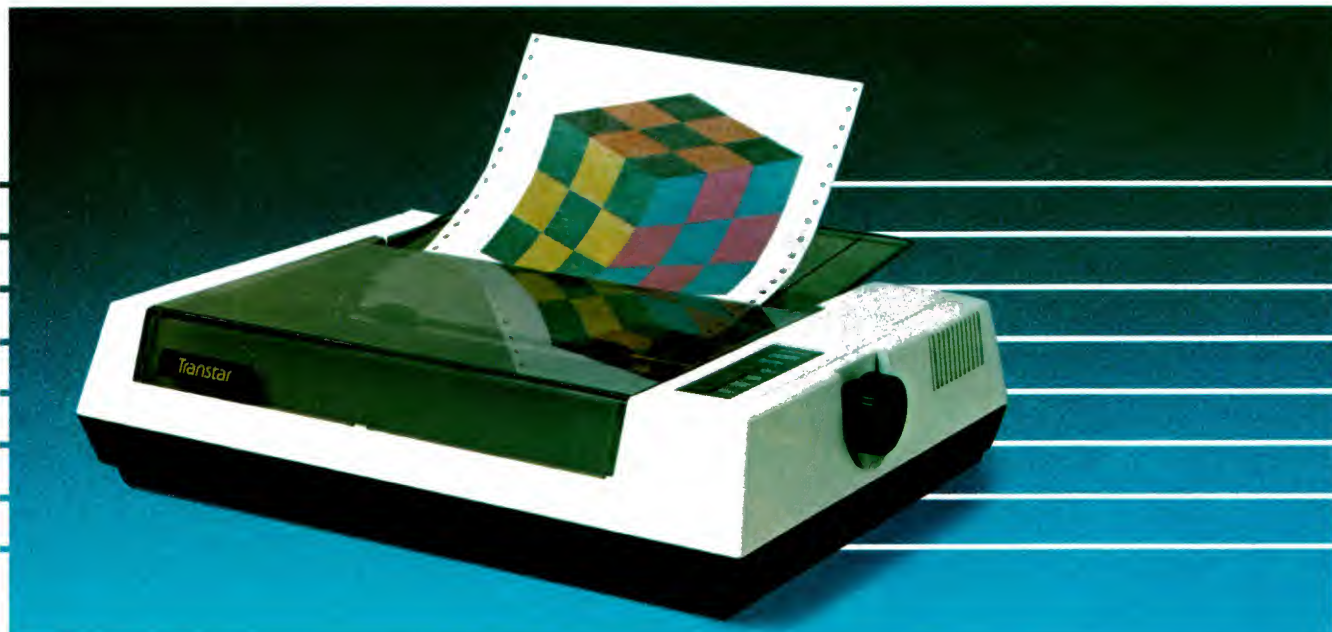
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THE SOLAR C



Micros are instigating a revolution in solar building design.

by Bill Smith

We all experience the power of passive solar space heating when we enter an automobile parked in the sun. As such, passive solar design may appear to be a simple process—just orient the structure toward the sun. In fact, passive solar buildings are thermally dynamic structures, involving the complex interaction of many variables. Solar design calculations must compensate for ever-changing external (ambient) temperatures and amounts of available solar energy, and consider orientation, light transmission and tilt of the collecting surface, the building's heat storage capacity, amount and type of insulation, and climate, among others. The computer is an excellent tool for performing these calculations, because it can keep track of the many possible building design variations and offers immediate feedback on how a given change will affect the energy performance of a structure, all without wading through hours and sometimes days of hand calculations.

CONNECTION



The buildings pictured on this page and the preceding two illustrate the types of passive solar systems discussed in "The Solar Connection." The spread on pages 34 and 35 shows the interior and exterior of a bank with south-facing direct gain windows and masses of brick for heat storage. On this page, starting in the lower right, a water wall in another bank consists of water-filled tubes of glazing. A curtain of nighttime insulation on the outside is partially drawn to better display the tubes. Moving clockwise, in the lower left a renovated brick row house employs old balconies (left) as sunspaces (greenhouses) and a wall with windows as a vented Trombe wall. Above the row house, the second story of another brick building has also been faced with glazing to form a vented Trombe wall. This Trombe wall sports an overhang for shading in the warm months. The school in the upper left features a sunspace (below) and an unvented Trombe wall. Finally, in the upper right, a greenhouse of the traditional variety for growing plants serves as a sunspace for a home. The photos were supplied by the New England Solar Energy Association, Brattleboro, VT.



Table 1.
Formulas for calculating heat conduction
and air exchange.

1) The formula for heat conduction is $Q = \text{area} \times \Delta T \times \text{time} / R\text{-value}$, where Q is the number of BTUs transferred, area is the square footage of the building component in question, and ΔT is the difference in temperature in degrees Fahrenheit between inside and outside for the time period in question. (When calculated for the entire heating season, the average inside and outside temperatures are used.) Time is the number of hours in question and R-value is a measure of the building component's insulative value, also known as the resistance to heat loss.

2) The formula for air exchange is $Q = \text{volume} \times \text{AC/hr} \times \Delta T \times \text{time} \times .018$, where Q is the number of BTUs transferred, volume is the volume of the structure, AC/hr is the structure's air exchange rate, and ΔT and time are the same as for heat conduction. The constant .018 is the product of the air density and the specific heat of air, which varies according to altitude.

Passive solar design is such a new field that designers have largely missed the era of mainframe computers. Today, at least 15 microcomputer software packages exist, many for the Apple, that can help evaluate a building's energy performance and cost-effectiveness. All are valuable tools for planning buildings that work well. See "A Solar Survey" and "F-Load: A Solar Design Tool" in this issue for information on a number of these packages.

Passive solar space heating can be defined as that form of solar heating in which the building itself is a solar collector. A typical passive solar building simply incorporates a large expanse of south-facing glass that allows considerable low-angled wintertime sunlight to enter. After passing into the building, this light strikes solid objects and is converted into heat. While the glass transmits shortwave radiation (light) coming in, it largely retards the passage of longwave radiation (heat) going out. Simply put, when the solar gain (input) is greater than the heat loss, the building stays warm from the heat of the sun (the "greenhouse effect"). When the heat loss is greater than the solar gain (at night, for instance), the building may need auxiliary heat.

Auxiliary energy need is the key indicator of a building's energy performance. Energy performance is usually defined as the amount of auxiliary energy the building needs to maintain a given temperature (say 70° F) for the entire winter. That amount is often expressed in millions of British Thermal Units. (One BTU is the amount of heat necessary to raise the temperature of one pound of water one degree Fahrenheit. It is approximately equal to the heat given off by a single wooden match.) It can also be expressed in gallons of oil, cubic feet of gas, kilowatt hours of electricity, or even dollars.

Calculating Heat Loss

The first step in the computer-aided design process is to calculate a building's yearly heat loss. These calculations are fairly standardized and are

usually based on the methods developed by the American Society of Heating and Refrigeration Engineers, also known as ASHRAE. Heat loss calculations are divided into two types to represent the two major forms of heat loss in a typical home: heat conduction and air exchange.

Heat conduction is the transfer of heat through solid objects. (You feel conducted heat when you touch the handle of a hot frying pan.) The calculation is done for every major surface and takes into account its size and degree of insulation (R-value), and the temperature difference between outside (ambient) and that desired inside.

Air exchange (infiltration) is the process of cold air leaking into the structure and warm air leaking out because of inadequate sealing. The air exchange calculation is done for the building as a whole, and takes into account the structure's volume and airtightness, and the temperature differential. (Keep in mind that airtightness can really be known only after the building is built and only if it is specifically measured.) See Table 1 for formulas for calculating heat conduction and air exchange.

The sum of heat conduction and air exchange is the total heat loss. In the pre-solar era, heat loss calculations were all that were necessary to determine a building's auxiliary energy needs, because without significant solar input, the auxiliary energy needs are equal to the total heat loss. In a solar building, the auxiliary needs are equal to the total heat loss minus the solar energy gain.

Calculating Solar Gain

Most solar calculation methods are based on the work done at the Los Alamos National Laboratory and are detailed in two books from the American Solar Energy Society, *The Passive Solar Design Handbook*,

Volume II (Douglas Balcomb, ed.) and *The Passive Solar Design Handbook, Volume III* (Robert Jones, ed.). These Los Alamos scientists were among the first to exhaustively monitor solar buildings with the aid of a computer. Their detailed computer models predicted how theoretical structures would perform. These predictions were compared to actual temperatures in test buildings, which then led to further refinement of the computer models. Virtually every solar software package that exists today and calculates a building's yearly energy performance is a distillation of these Los Alamos computer models. Much of what follows is based on one such package for the Apple, SUNPAS from Solarsoft Inc., Box 124, Snowmass, CO 81654.

The purpose of solar calculations is to determine the amount of energy received from the sun that is useful in reducing a building's auxiliary energy needs. The process is begun by translating raw solar radiation data based on one square foot of shaded horizontal collector surface into the number of BTU that strike the total area of each collection surface (typically glass), taking tilt and compass orientation into account. This data is available for your region for every month of the year (in the form of BTU per square foot on an average day) from the *Passive Solar Design Handbook* and the National Atmospheric and Oceanic Administration.

In the Northern Hemisphere, the

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BASE CASE WITH MOVABLE INSULATION

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YEARLY ENERGY SUMMARY

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MONTH	GROSS SOLAR	HEAT LOSS	INT GAINS	USEFUL SOLAR	AUX HEAT
JAN	1.7	5.2	1.9	1.2	2.1
FEB	1.7	4.6	1.7	1.2	1.7
MAR	1.6	4.0	1.9	1.1	1.1
APR	1.2	2.8	1.8	0.7	0.3
MAY	1.1	1.6	1.6	0.0	0.0
JUN	1.0	0.5	0.5	0.0	0.0
JUL	1.1	0.0	0.0	0.0	0.0
AUG	1.2	0.0	0.0	0.0	0.0
SEP	1.5	0.7	0.7	0.0	0.0
OCT	2.0	2.2	1.8	0.4	0.0
NOV	1.5	3.2	1.8	0.9	0.5
DEC	1.4	4.4	1.9	1.0	1.6
YEAR	17.1	29.2	15.5	6.5	7.2

Table 2.

SUNPAS Yearly Energy Summary tabular printout.

cally varies this correction factor from 0.5 to 1.3, where 0.5 represents a 50 percent reduction, 1.0 represents no reduction or additional gain, and 1.3 represents 130 percent of the "normal" gain.

Passive Solar Systems

As if all of these options weren't enough, the solar designer can also select from five different types of passive solar construction, as defined by the third volume of the *Passive Solar Design Handbook*. These include a direct gain system, a greenhouse, a Trombe wall, a Trombe wall that's vented into the living space, and a water wall.

A direct gain system is the simplest form—an expanse of south-facing glass that admits the low winter sun. Attached greenhouses are the most well-known type, and can expand a home's living or vegetable-growing area. Trombe walls and water walls are systems in which a thermal mass is placed directly behind an expanse of south-facing glass. The thermal mass in a Trombe wall is usually concrete or brick.

System Variables

Direct gain systems can vary in thermal storage capacity, ratio of thermal mass to glazing area, number of glazing layers, and the use of movable night insulation. Attached greenhouses can be enclosed within the house or merely appended, the wall common with the building can be masonry or insulated, end walls can be opaque, glazed, or common with the building, movable night insulation can be used or not, and the tilt of the glazing can be varied. With Trombe and water walls, options include thermal storage capacity, wall thickness, number of glazings, normal or selective surface, and the use of movable night insulation. (A selective surface absorbs solar radiation at a faster rate than a normal surface.) In total, the designer can choose among 94 types of passive solar systems.

Program Output

The Yearly Energy Summary table (Table 2) and bar graph (Figure 1) are the most useful outputs of the SUNPAS program. The graph is merely a picto-

optimal orientation is due south and the optimal glass tilt is 15 degrees greater than your latitude. The theoretical optimum is not always the most practical, however, so the computer is very helpful in determining just what kind of penalty you will incur by straying from the optimum. Many solar designers will orient a building slightly east of south, in order to get more morning sun and to thus "wake up" a building.

At a latitude of 45 degrees, a 60-degree tilt is optimum for heat collection purposes, but is also hard to build and tends to overheat the building in the summer. Thus, many designers opt for vertical glass, which does not collect quite as much heat during the winter, but is much easier to build and, especially with an overhang, does not tend to overheat the structure during summer. Vertical glass also has the advantage of collecting a little extra sunlight reflected from snow.

An overhang is usually placed above vertical glass to block out the high summer sun, yet pass the low winter sun. However, it does block some sunlight during cool seasons and pass some during warm seasons. To achieve the best balance, solar software allows the designer to vary the degree of overhang.

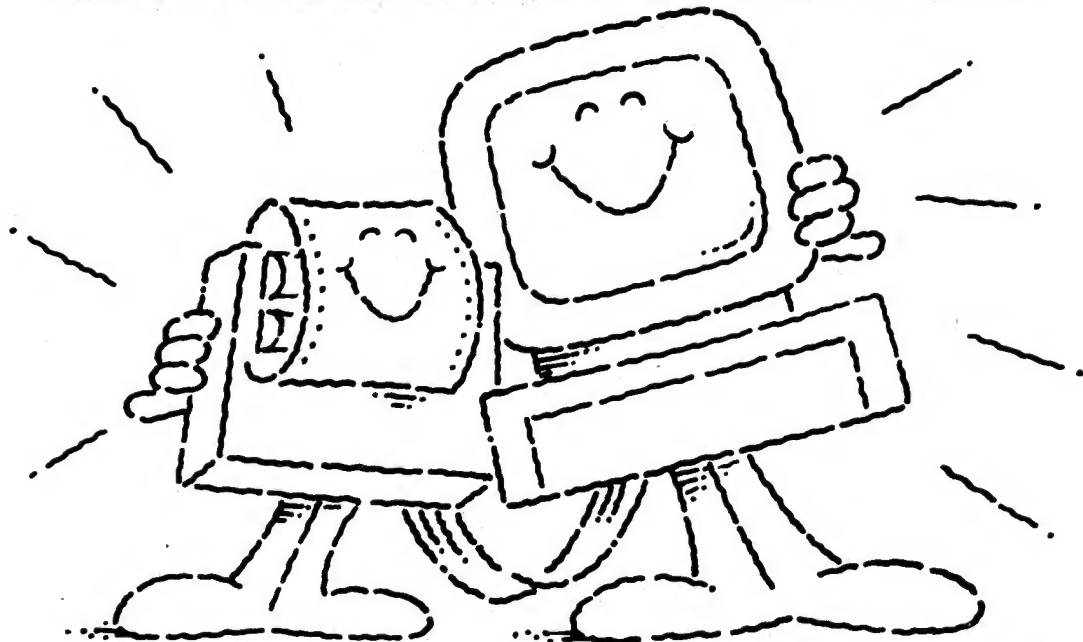
Different types of glass and plastic glazings vary in their ability to transmit sunlight (transmissivity). For space

heating purposes, the higher the transmissivity the more solar gain. By varying the transmissivity parameter, the solar designer can compare the performance of various types of glazings.

After passing through the glazing, sunlight strikes interior objects and converts to heat. If those interior objects are lightweight, they quickly absorb all the heat they can and start releasing excess to the surrounding air. Even in the middle of winter, a lightweight building with a lot of south-facing glass will get unbearably hot in the course of a day and retain little heat for the night. Passive solar buildings, therefore, must incorporate materials (usually masonry or water) called thermal masses that are good at absorbing and holding heat during the day to be released at night when it is needed most. Absorptivity is a quantification of this storage capacity. By varying the absorptivity parameter, the designer can gauge the effectiveness of various storage systems.

In addition to the above variables, solar software includes a correction factor for shading from adjacent buildings or trees, and additional gain due to reflection from snow, water or man-made materials. If deciduous trees lie to the south, the shading factor will vary depending on how many leaves are on the trees. Also, the low winter-time sun tends to be blocked by neighboring buildings and trees. With the SUNPAS program, the designer typi-

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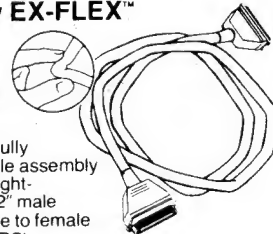
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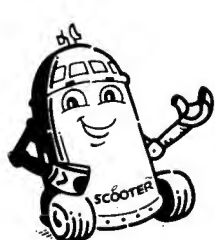
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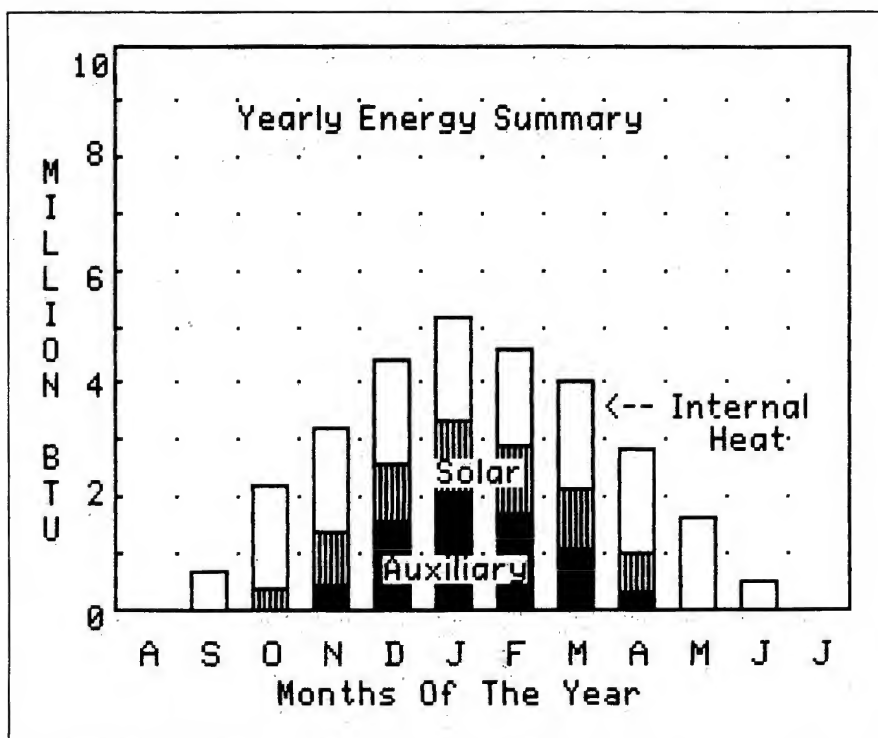


Figure 1.
SUNPAS Yearly Energy Summary graph
printout.

heating system for a particular month to maintain the average temperature. The total of this column is the most significant item on the table, and should be used to compare various building configurations. To convert to dollars, multiply by \$23 (approximately) for electric and \$10 (approximately) for oil. The building represented here has a remarkably low heating need because it is well-exposed to the sun, is virtually airtight and is superinsulated.

The bar graph illustrates the energy performance of the building from August to July. The vertical scale is in million BTU. The white area represents internal heat gains, the striped is the solar gains, and the black is the auxiliary heating requirement.

The Yearly Energy Cost graph (Figure 2) illustrates the effect of increasing or decreasing the south-facing glazing area on the building's heating costs. The curves for oil, gas and electricity represent the heating costs for each auxiliary fuel. As you can see, the heating costs decrease as the south-facing glazing area increases.

Other Systems

While I have discussed only passive solar here, there are other types of solar software, including active solar, daylighting and photovoltaics. (See "A Solar Survey" for available packages.) Active systems involve the mechanical transport of heat in a medium such as air or water from a roof- or ground-mounted collector to a heat storage system. This heat is then pumped, as needed, to where it will be used in the building for space heating or hot water.

Daylighting systems use sunlight to offset needs for artificial light. Photovoltaic systems use silicon cells to convert solar radiation into direct current electricity. (See "The Alternative Apple" in this issue for a description of how you could run your Apple from such a source.)

Solar design, as we have seen, involves many considerations. SUNPAS and its ilk can go a long way in determining the best configuration for your needs. This brief survey will, I hope, help you understand what these programs can—and cannot—do. ■

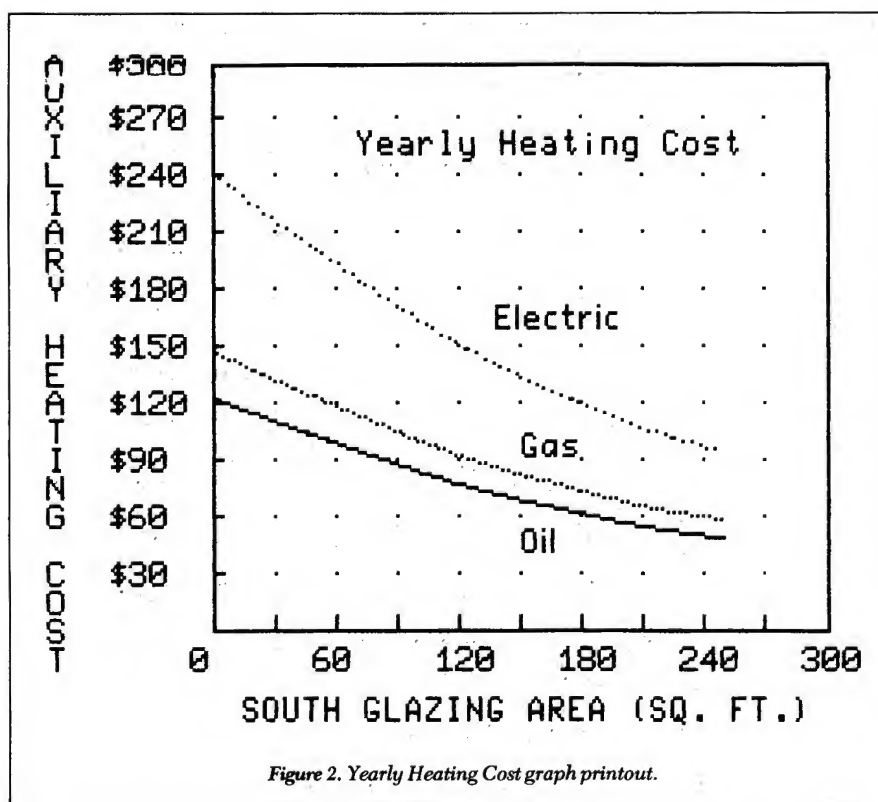


Figure 2. Yearly Heating Cost graph printout.

rial representation of the table. All numbers are in million BTU. Gross Solar is the total amount of solar radiation transmitted into and absorbed by the building. Useful Solar is that portion of Gross Solar that helps to offset auxiliary heating needs, without overheating the building.

Heat Loss is the total heat loss experienced by the building for a month. It

is identical with the total of auxiliary, solar and internal gains, and is represented by the top of each bar in the bar graph.

Internal Gain is heat derived from people, appliances and lights that is useful in offsetting auxiliary heating needs.

Auxiliary Heat is the total number of BTU required of the auxiliary

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A Solar Survey

Here is a comprehensive guide to software that will help you and your Apple plan a solar building.

by Terry Brennan

There are numerous software packages on the market for use in planning buildings designed to meet some of their energy needs with solar radiation. These programs project energy yields and losses as the values of building parameters are changed. This data then helps the designer decide what building configuration will be most energy efficient. (See "The Solar Connection" in this issue for a more detailed discussion of such planning.)

This compendium of software aids will help anyone intending to use an Apple in designing a new solar building, or a solar retrofit, to zero in on the program best suited to their needs. The software is divided into three types:

- 1) *loads* programs that estimate conventional heating and cooling needs, taking into account adding solar energy to a building, adding extra insulation, sealing tightly and improving equipment efficiency;
- 2) *daylighting* programs that project lighting levels in buildings with an eye to replacing electric lights with daylight from windows; and
- 3) *photovoltaic* programs that estimate the amount of electricity that can be derived from solar cells that convert sunlight directly to electricity. (See "The Alternative Apple" in this issue for a description of how your computer can be run from such a source.)

Loads programs vary in the sophistication of the algorithms used to do the calculations and in their suitability for use on residential or commercial buildings. Also, some loads programs do *monthly* load calculations based on the available solar energy and outside temperature for the average day of the

month, and the physical characteristics of the building. Others make *hourly* load calculations based on solar energy and temperature data for each hour of the day. Although mainframe programs of this type solve the heat flow equations for each hour of the year, the runtimes required to do this on micros are several hours, so hourly calculation programs for micros have adopted statistical methods of compressing hourly data to a few dozen typical days per year.

F-Chart programs use a simplified monthly loads calculation in combination with a calculation to estimate the performance of active solar systems.

Monthly Loads Programs

Monthly loads programs are most suited to residential analysis.

SUNPAS covers passive solar including direct gain, mass walls and attached greenhouses. One of the most sophisticated of the many programs based on solar correlations developed at the Los Alamos Scientific Laboratory, this program packs a great deal of information into the output, including good quality charts and graphs. SUN-OP is an economic analysis program accompanying SUNPAS. Contact Solarsoft, Box 124, Snowmass, CO 81654. Price, including both programs, is \$400.

SLR covers passive solar including direct gain, mass walls and attached greenhouses. It is a good easy-to-use program, also based on the LASL solar methodology. Contact Alternologies, Box 1008, Fort Collins, CO 80522.

F-Load covers passive solar direct gain and mass walls, but not green-

houses. Based on fundamental physical principles, the calculations are far more flexible than those based on correlations. The methodology was developed by the authors to be used as a computerized calculation procedure. F-Load incorporates easy-to-use on-screen editing. See "F-Load: A Solar Design Tool" in this issue for a detailed review of the program. Contact F-Chart Software, 4406 Fox Bluff Road, Middleton, WI 53562. Price \$425, with updates for \$35 each.

Hourly Loads Programs

TSWING covers passive solar including direct gain, mass walls and greenhouses. Hourly temperature profiles of room and ambient (outside) air, and thermal masses are output in tabular and graphic form. Sophisticated treatment of energy flows is limited to hourly calculations of 14 days. Although this is sufficient for using compressed weather data to make yearly estimates of energy performance, the program is not set up to do so. TSWING is most valuable for closely examining comfort issues under a variety of conditions. A separate accompanying program, SOLGAIN, interprets the TSWING data for the user. Contact Solarsoft, Box 124, Snowmass, CO 81654. Price for the package is \$400.

MICROPAS also covers passive solar including direct gain, mass walls and greenhouses on an hourly, monthly and yearly basis. This is the most sophisticated program available for the

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Apple that has short enough runtimes to be of use to the average designer. It will analyze three zones and output information in a variety of formats. MICROPAS is suitable for some commercial applications. For the Apple, it requires 64K and CP/M. Contact Enercomp, 2655 Portage Bay, Suite 6, Davis, CA 95616. Price is \$795 for the CP/M version.

F-Chart Programs

F-Chart programs to estimate the performance of active solar air- and water-based systems are available from F-Chart Software (the originators of the method), 4406 Fox Bluff Road, Middleton, WI 53562, price \$400 (\$35 for updates); and Solarsoft, Box 124, Snowmass, CO 81654, price \$400.

Daylighting Programs

Daylighting programs predict potential natural illumination levels at any point in a building. Armed with this knowledge, a designer can provide for substantial energy savings in buildings that use a lot of electric lights during the daylight hours by substituting sunlight. Office buildings and schools are good candidates for this type of conservation plan because of their schedules and because of the size of their lighting bills.

The following daylighting programs are currently available for Apples:

MICROLITE. To obtain MICROLITE you must join the Designers' Software Exchange, Room 4-209, MIT, 77 Massachusetts Ave., Cambridge, MA 02139, for \$25. Then the program is available for an additional \$25. However, if a program of your own is accepted by the Exchange, you can get ten others, including MICROLITE, free.

DAYLITE from Solarsoft, Box 124, Snowmass, CO 81654. Price \$750.

Photovoltaic Programs

Photovoltaic programs are used to estimate the contribution a system of solar cells will make to the electricity needed by a building. Advances currently being made in this field promise to make this technology widespread within the next decade. Although several programs have been written to

project photovoltaic performance, only one, *PV F-Chart*, is currently being marketed. It is available from F-Chart Software, 4406 Fox Bluff Road, Middleton, WI 53562. Price \$400, plus \$35 each for updates.

For the Layperson

The following two programs touted as appropriate to the non-professional have been appended to "A Solar Survey" by the *inCider* staff. Information is from the software vendors. We hope to review these programs in the near future.

HOTCAN 2 predicts heat loss and solar gain for a structure on a monthly or yearly basis. Input includes R-value and area of structural surfaces, number of glazings on windows, geographic location, and more. Output appears as dollar cost per month or year. The Apple version includes climatic data for 12 locations in Canada, with space for four user-provided alternatives. Improvements contained in **HOTCAN 3**, currently in preparation, will include U.S. weather data, an enhanced foundation loss routine and solar gains for the 45° directions (NE, SE, SW, NW). Contact the Division of Building Research, National Research Council of Canada, Saskatoon, Saskatchewan S7N 0W9. Price is \$25, Canadian funds, payable to the Receiver General of Canada.

The Home Energy Opti-Miser is a highly interactive program that includes an extensive workbook to use in input preparation. Output indicates where heat loss is occurring and how significant it is, and recommends specific measures for alleviating the problem. Six thousand possible energy system configurations are offered for the user's consideration. Contact Shelter Software, Box 527, Emmaus, PA 18049. Price is \$24.95.

The Solar Energy Research Institute has compiled a booklet, *Microcomputer Methods for Solar Design and Analysis*, listing 30 software packages covering all aspects of passive and active solar design. Each listing includes the name and address of the vendor, price, and machines the program runs on. Send \$7 (prepayment is a must) to SERI Document Distribution Service, 1617 Cole Blvd., Golden, CO 80401. ■

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F-Load

A Solar Design Tool

Our reviewer has worked extensively with this solar design package and finds it the cream of the crop.

by Joe Kohler

Passive solar and super-insulated buildings are increasingly capturing the interest of homebuyers. Thermal performance has suddenly become an important factor to consider when designing a house. Many architects, mechanical engineers and energy analysts are looking to computer design tools to help size passive glazing areas and to find the best insulation levels for walls and ceilings. Some builders and developers find that a computer print-out of energy use is a useful sales tool. (See "The Solar Connection" in this issue for a discussion of the basics of passive solar design.)

F-Load, a program for the Apple created by Beckman and Associates, is one of several programs that have recently been marketed to calculate the energy use of residential buildings. (See "A Solar Survey" in this issue for a compendium.) These energy analysis programs calculate the monthly heating energy requirements of homes, accounting for solar energy gains (input) through passive systems. Most are based on Solar Load Ratio (SLR) correlations developed at the Los Alamos Scientific Laboratories by a team headed by J. Douglas Balcomb. (See the *Passive Solar Design Handbook, Volume III*, American Solar Energy Society Inc.) F-Load, however, is based on a substantially different algorithm, developed at the University of Wisconsin Solar Energy Laboratory and the National Bureau of Standards. As a result, F-Load has many features not

found in other programs.

F-Load is unique in that it calculates cooling loads as well as heating loads, which makes it valuable for analyzing houses in areas of the country where cooling is an important consideration. In addition, F-Load models the performance of heating and cooling equipment instead of simply assuming a "seasonal efficiency," as most other programs do. F-Load also more accurately accounts for the effect of setting a thermostat back than most other programs. And it can perform a detailed economic analysis if that is desired.

Using F-Load

F-Load is an interactive, "user-friendly" program with extensive error trapping and default values for all parameters. It can work in either English or SI (Système International) units.

When you boot up F-Load, you have three choices:

- 1) run F-Load Energy Analysis,
- 2) enter Equipment Specifications, and
- 3) run Sysgen program.

The Sysgen program modifies F-Load for your particular computer system. You enter the number of disk drives, information about your printer, and your name and address for use in the program heading. It is only necessary to run Sysgen the first time you use F-Load, or if you make

alterations in your system.

The *Equipment Specifications* program is used to input parameters that describe the heating and cooling equipment that will be used in the house being analyzed. Required information includes the heating and cooling capacity (the size of the equipment necessary for the coldest and hottest days), and the efficiency of the equipment as a function of temperature. Also needed is data on the efficiency of equipment when it is operating at only part of its capacity. If you're not a mechanical engineer familiar with equipment, you will probably find it difficult to get some of this information and put it in the correct format. The program contains defaults for most common heating and cooling systems, but the efficiency of equipment does vary a lot. Once the data is obtained, it can be stored on disk for use with other buildings.

Another minor difficulty arises from the fact that you need to specify the capacity of the equipment in order to run this program. However, the ca-

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capacity isn't really known until you run the Energy Analysis program. Unless you are experienced at estimating equipment capacity, you may need to run the program twice—once to size the equipment, and then again to model the equipment properly.

Energy Analysis

The *Energy Analysis* program is the heart of F-Load. This is where the building and its passive systems are described and data regarding the location, occupancy, and so forth, is entered.

The data input routine is particularly nice. The first screen contains a listing of *Basic Building* parameters and their default values (Figure 1). Simply enter the parameter numbers and the new values for any parameters that you wish to change.

The next several screens contain the *Wall* parameters (Figure 2). Each wall can have a different orientation. Windows will have different day and night R-values to account for night insulation, and can be at any tilt. The program "knows" the number of glazings based on the day R-value, and estimates solar transmittance accordingly. Any wall thus accounts for passive solar gains. There are two special passive solar walls: a storage (Trombe) wall and a direct gain wall (Figure 3). The routines for these walls allow you to model a fixed overhang. With the direct gain wall you can also specify both the R-value and the number of layers of glazing, which might be necessary with some of the new glazing materials.

Following the Wall parameters, the *Roof-Basement-Garage*, *Internal Space* (Figure 4) and *Economics* screens appear. The Roof-Basement-Garage routine allows you to model slab on grade, crawl spaces, basements (or any combination) and attached garages. The equipment files created in the Equipment program are entered on the Internal Space screen, along with the number of people, the type of domestic hot water (DHW) heater, and thermostat settings for heating and cooling.

Editing F-Load inputs is easy. For example, to change parameter 2 in Basic Building to 90 degrees (to deter-

mine the effect of rotating the building) type B 2 90. To list parameters for Internal Space type I L.

When all the data is entered, the building description can be saved on disk. Then it's time to press C to begin the calculations.

F-Load Output

F-Load provides four levels of output. Level 2, an annual summary, appears in Figure 5. It shows the heating losses or cooling gains through individual building components, the total en-

```

** BASIC BUILDING **
1 CITY LOCATION..... 164
2 REFERENCE ANGLE WRT SOUTH..... 0 DEG
3 HEATED AIR VOLUME..... 11355 FT3
4 CONSTR QUAL (0 TO 3 OR NEG)... 1
5 NUMBER OF EXTERIOR WALLS..... 8
6 SET ALL EXTERIOR WALL R-VALUES 16.4 FT2-HR-F/BTU
7 SET ALL WINDOW DAY R-VALUES... 2.2 FT2-HR-F/BTU
8 SET ALL WINDOW NIGHT R-VALUES 2.7 FT2-HR-F/BTU
9 STORAGE CAP (0 TO 3 OR NEG)... 1
10 OUTPUT 1=SUMMARY TO 4=DETAILED 3
11 GRAPHIC OUTPUT? 1=Y 2=N..... 2

```

Figure 1. Sample input for the Basic Building routine.

```

** WALL 1 **
1 ORIENTATION WRT TO REFERENCE.. 0 DEG
2 GROSS WALL AREA..... 306 FT2
3 EXTERIOR WALL R-VALUE..... 16.4 FT2-HR-F/BTU
4 WINDOW AREA..... 56 FT2
5 WINDOW DAYTIME R-VALUE..... 2.2 FT2-HR-F/BTU
6 WINDOW NIGHTTIME R-VALUE..... 2.7 FT2-HR-F/BTU
7 WINDOW % OF TIME SHADED..... 0 %
8 DOOR AREA..... 21 FT2
9 DOOR R-VALUE..... 2.56 FT2-HR-F/BTU
10 WINDOW TILT FROM HORIZONTAL... 90 DEG
11 WALL SOLAR ABSORPTIVITY..... .4

```

Figure 2. Sample input for the Ordinary Wall routine.

```

** WALL 7 STORAGE WALL **
1 ORIENTATION WRT REFERENCE..... 0 DEG
2 STORAGE WALL AREA..... 200 FT2
3 NUMBER OF GLAZINGS (1 TO 4)... 2
4 WALL THICKNESS..... 1.5 FT
5 WALL THERMAL CONDUCTIVITY..... 1 BTU/HR-FT-F
6 WALL SPECIFIC HEAT*DENSITY... 30 BTU/FT3-F
7 WALL SOLAR ABSORPTANCE..... .9
8 NIGHT INSULATION R-VALUE..... 0 FT2-HR-F/BTU
9 OVERHANG SHADING? 1=Y 2=N..... 2
10 WIDTH OF WINDOW..... 0 FT
11 PROJECTION OF OVERHANG... 0 FT
12 OVERHANG-WINDOW GAP..... 0 FT

** WALL 8 DIRECT GAIN **
1 ORIENTATION WRT REFERENCE..... 0 DEG
2 DIRECT GAIN WINDOW AREA..... 200 FT2
3 NUMBER OF GLAZINGS (1 TO 4)... 2
4 DAYTIME GLAZING R-VALUE..... 1.8 FT2-HR-F/BTU
5 NIGHTTIME GLAZING R-VALUE..... 1.8 FT2-HR-F/BTU
6 OVERHANG SHADING? 1=Y 2=N..... 2
7 WIDTH OF WINDOW..... 0 FT
8 PROJECTION OF OVERHANG... 0 FT
9 WINDOW-OVERHANG GAP..... 0 FT

```

Figure 3. Sample input for the Storage Wall and Direct Gain Wall routines.

```

** INTERNAL SPACE **
1 ANNUAL ELECTRICAL CONSUMPTION. 8000 KW
2 AVERAGE NUMBER OF OCCUPANTS... 4
3 HEATING LOAD CALC (1=Y 2=N)... 1
4 DAYTIME THERMOSTAT SETTING.. 72 F
5 NIGHTTIME THERMOSTAT SETTING 68 F
6 EQUIPMENT FILE NAME..... FURNACE
7 COOLING LOAD CALC (1=Y 2=N)... 1
8 DAYTIME THERMOSTAT SETTING.. 78 F
9 NIGHTTIME THERMOSTAT SETTING 78 F
10 ROOM RELATIVE HUMIDITY..... 40 %
11 VENTILATION (1=Y 2=N)..... 1
12 MOISTURE GENERATION..... .5 LBM/HR
13 EQUIPMENT FILE NAME..... AIRCOND
14 HOURS FOR NIGHT SETTING..... 8 HOURS
15 ALLOWABLE TEMPERATURE SWING... 9 F
16 VENTILATION HX EFFECTIVENESS.. 0 %
17 VENTILATION HX FLOWRATE..... 0 CFM
18 DHW CALCULATION (1=Y 2=N)..... 1
19 DHW LOSS TO SPACE (1=Y 2=N)... 2
20 DHW(1=EL;2=NG;3=OIL;4=OTHER) 1
21 WATER HEATER EFFICIENCY..... 100 %
22 AVERAGE DAILY HOT WATER USE. 80 GALLONS
23 HOT WATER SET TEMPERATURE... 140 F
24 R-VALUE OF TANK INSULATION.. 2 FT2-HR-F/BTU
25 HOT WATER TANK VOLUME..... 40 GALLONS

```

Figure 4. Sample input for the Internal Space routine.

velope (ENV) losses or gains, the total solar and internal gains from people and equipment (GAIN), the EXCESS gains that can't be used for heating, the dehumidification (LATENT)

loads, and the final heating (AUX) and cooling (A/C) loads. It also shows the design heating and cooling loads that you need to size the equipment, and it gives the purchased energy require-

```

*** HEATING ENERGY (MMBTU) ***
ALL WALLS
MONTH WALL WINDOW DOOR SOLAR
YR 19.76 7.34 5.14 15.14

MONTH ROOF BSMT INFIL GARAGE
YR 7.02 5.59 17.86 8.38

MONTH (ENV) GAIN EXCESS AUX
YR 65.49 49.62 20.58 36.46

*** COOLING ENERGY (MMBTU) ***
ALL WALLS
MONTH WALL WINDOW DOOR SOLAR
YR 0.00 0.00 0.00 15.14

MONTH ROOF BSMT INFIL GARAGE
YR 0.00 0.00 0.00 0.00

MONTH ENV GAIN LATENT A/C
YR 0.01 49.62 0.80 3.37

*** DESIGN VALUES ***
DESIGN HEATING LOAD = 31400 BTU/HR
LOSS/(AREA-DD) = 6.5 BTU/FT2-F-DAY
DESIGN COOLING LOAD = 14200 BTU/HR

*** PURCHASED ENERGY (MMBTU) ***
HEATING
MONTH AUX DEL SHORT PURCH
YR 36.46 36.46 0.00 48.61

*** PURCHASED ENERGY (MMBTU) ***
COOLING
MONTH A/C DEL SHORT PURCH
YR 3.37 3.37 0.00 1.61

```

Figure 5. Sample annual summary output. (MMBTU is million BTUs.)

ments that account for the actual efficiency of the equipment.

Level 1 output is similar, but doesn't show the component losses or gains. Level 3 output presents the above information for every month of the year. Level 4 shows the wall, window, door and solar values for each individual wall. In addition, graphic outputs (Figure 6) are available. Thus, it is possible to get just about any level of detail you need to understand how the house is using energy or to make a presentation to others.

Output can be directed to the screen only, or to the screen and printer. You can "pause" the output if desired.

F-Load Calculations

F-Load calculates monthly energy use based on the envelope loss or gain, solar heat gains, internal heat gains from appliances, people and lights, foundation losses, and thermal storage.

F-Load has built-in weather data for 329 cities. This data includes average monthly temperatures and degree days (a parameter that represents outdoor temperature in heat loss calculations), solar radiation data, and design day (the temperature extremes used in determining maximum heating and cooling loads for sizing equipment) data. You can add data or modify existing data if you desire.

The F-Load algorithm does a much better job of treating the interaction between overheating, thermostat setback and thermal mass than the popular SLR method. The latter implicitly assumes that the building temperature drops instantly to the low setting when the temperature is set back at night. This would be true only for a zero-mass building, so the SLR algorithm overestimates the energy savings in a heavy mass passive solar building. F-Load calculates the rise in temperature during the day due to solar and internal gains, the time it takes to discharge the mass and cool to the night setting, and the energy required to bring the building up to temperature the next day. It then adjusts the degree days and energy flow appropriately.

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```
WALLS !*****
WINDOW !*****
DOORS !*****
ROOF !*****
BSMT !*****
INFIL !*****
GARAGE !*****
```

0 -----!-----! 20
MMBTU

HEATING ENERGY

```
JAN !*****
FEB !*****
MAR !*****
APR !*****
MAY !*****
JUN !*****
JUL !*****
AUG !*****
SEP !*****
OCT !*****
NOV !*****
DEC !*****
```

0 -----!-----! 9
MMBTU

Figure 6. Sample graphic outputs. (MMBTU is million BTUs.)

consuming solar calculation results are saved in memory.

The economics routine in F-Load is one of the best and most detailed available. A sample output appears in Figure 7. It allows you to calculate the life-cycle cost of owning and operating a passive solar building compared to a conventional building. Of course, any life-cycle analysis is only as good as the crystal ball you use to predict fuel costs and inflation rates into the future.

One important limitation of F-Load is that it does not explicitly model sunspaces. You can estimate the performance of low mass sunspaces (such as greenhouses), if you know what you're doing, by assuming they are part of the direct gain space during the day, and counting the R-value of the wall that separates the sunspace from the house as night insulation.

The User's Manual

The user's manual is excellent. It contains an overview of the program, descriptions of all of the input parameters and the program outputs, a detailed explanation of the algorithms used, and forms to use to prepare input data. In addition, the program has its own help commands. Even without the manual, most engineers and architects who have done energy analysis before should find F-Load easy to use.

System Requirements

F-Load requires an Apple, Apple II, or Apple IIe with 64K and at least one disk drive. The program is written in Basic and is not copy protected. It is available at a cost of \$425 from F-Chart Software, 4406 Fox Bluff Road, Middleton, WI 53762.

Summary

If you need to predict the energy requirements of residential (and small commercial) buildings, F-Load is a good choice. The input/editing routine is easy to use. The variable output makes it possible to assemble reports to meet a variety of needs. The program handles thermostat setbacks well and its ability to do cooling calculations is valuable. The only major limitation is its inability to handle sunspaces. ■

*** ECONOMICS	
FIRST YEAR UTILITY COSTS	
HOT WATER ELECTRICITY	\$ 343
ELECTRIC UTILITIES	\$ 320
HEATING NATURAL GAS	\$ 194
COOLING ELECTRICITY	\$ 19
TOTAL UTILITIES	\$ 876
LIFE CYCLE COSTS	
HOT WATER ELECTRICITY	\$ 7600
ELECTRIC UTILITIES	\$ 7094
HEATING NATURAL GAS	\$ 4311
COOLING ELECTRICITY	\$ 419
EQUIPMENT	\$ 0
TOTAL	\$ 19424
BREAKDOWN OF EQUIPMENT COSTS	
EXPENSES	CREDITS
DOWN \$ 0	INTEREST \$ 0
MORTGAGE \$ 0	DEPREC \$ 0
MA & INS \$ 0	RESALE \$ 0
PROP TAX \$ 0	TAX CRED \$ 0

Figure 7. Sample economics output.

orientation are counted in the basic energy balance. Energy that can't be used is shown in the output as EXCESS. Large values of EXCESS in the winter months indicate that the building may have too much glazing or that there is not enough mass. This is very helpful information when you are designing a passive solar building.

F-Load requires about 10 minutes for a typical run with both heating and cooling calculations. Subsequent runs on the same building require about half that amount of time, since time-



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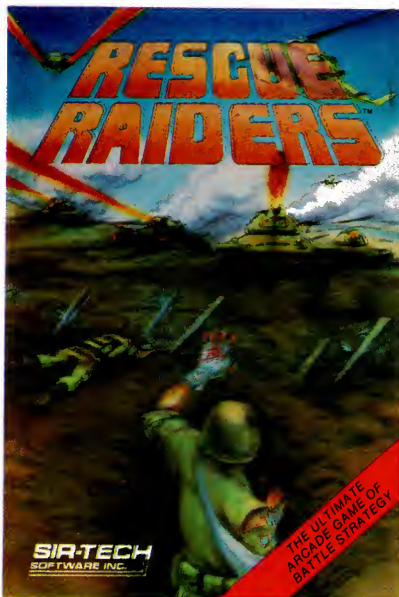
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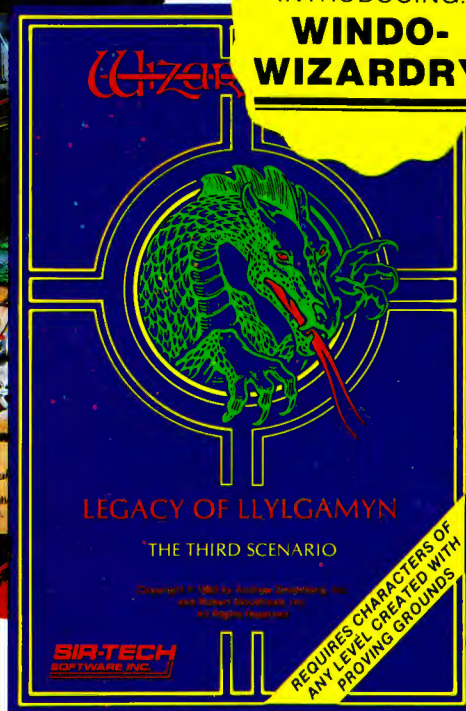
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Tackling the Building Environment

The first step in reducing energy costs and dependence on non-renewable energy sources should be lowering energy consumption. Here's how one man and his Apple are enabling businesses and homeowners to do just that.

by Nancy White Kelly and Carol M. Clerke



Carl Rutherford (on the right), an EMS consultant, gives a "hands on" demonstration of EMS programming.

Plunging Energy Bills Ahead! Now, that's a headline we'd all like to read. Thanks to the Apple computer and computerized energy management technology, lower utility bills are becoming reality.

A few years ago, Carl Rutherford, an energy management consultant, saw the "handwriting on the wall." Though Carl was a mechanical engineer at the time, he welcomed an invitation from Honeywell to study environmental control in Minneapolis. Carl was immediately introduced to the Apple computer, which was used for his training and for many in-house functions at Honeywell. Soon he was using the Apple for designing energy management systems.

Carl came home to Georgia a convinced man. With the aid of his Apple, he was ready to tackle the energy crisis. He began demonstrating to business owners how energy costs could be substantially lowered.

Business managers were eager to hear some encouraging news, as energy costs have risen for them at a far greater rate than for homeowners. In contrast to private homes, industries can be penalized for an entire month for one hour of peak energy use. In states with a "ratchet clause," a summer peak demand could

Dr. Nancy White Kelly is a free-lance educational consultant and president of Evalu-Ware, a software brokerage firm. Carol Clerke is a middle school teacher in Georgia's Dekalb County school system. Correspondence should be addressed to Dr. Kelly at 72 Valley Hill Road, Stockbridge, GA 30281.

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affect billing for the next six to twelve months.

The Energy Management System

At the heart of Carl's energy management program is a software package developed by Honeywell's Senior Application Specialist, Porter Higby. This sophisticated software is called RAMP, which stands for Remote Access Monitoring System. RAMP is configured for an Apple with two disk drives. It also needs a printer, an 80-column card, a modem and a clock card.

Once a business expresses interest in establishing an energy management system (EMS), Carl evaluates the need and installs the necessary on-site components. These generally include controllers for specific energy-consuming units such as air conditioners and lighting systems. Carl then ties these controllers into a programmable unit monitor that gives a reading of the building's power consumption. The monitor signals the controllers to switch load components on or off, according to programmed instructions. This prevents energy consumption from peaking beyond a set point that would result in costly utility bills for months to come.

In earlier days environmental control was maintained through mechanical relays or timers. Today, it is done with digital signals traveling over existing AC electrical wires from the central programming unit to the microprocessor controls.

Monitoring

Once the EMS is installed, Carl returns to his Georgia office and uses his Apple and RAMP for monitoring. Utilizing the Hayes Micromodem and normal phone lines, the computer automatically polls every system Carl has installed. This is done at 4:00 a.m. daily, and a printout is ready when Carl gets to the office.

These early morning reports consist of a one-page summary of energy usage and temperature at each site, along with a comparison with the same day in the four preceding weeks. If the report indicates an unexpected rate of energy consumption, Carl accesses the detailed history of energy use

at the individual site from the "Host Historical Data" stored on disk.

The data management capabilities of RAMP provide history files that can be displayed or printed. Hourly data for the last day polled is stored until the site is polled again. Daily reports are stored for up to a year, while monthly summaries are stored for ten years. The data disk also includes a copy of the control program for each site.

"One good thing about these morning reports," Carl emphasizes, "is that they provide an early warning of system failure. Most problems can be corrected immediately by modifications of the site control program using the Apple as a communications terminal." A hardware problem, such as a failure of the back-up relay, would be logged and corrected before it could cause a total system failure. Secondly, the records enable the customer to calculate energy savings resulting from the EMS.

Carl is quick to add that the installation of an energy management system is not a "set it and forget it" proposition. It takes about a year of "fine tuning" to achieve optimum savings with an EMS. Also, if equipment is added, if occupancy changes, or if building use plans are altered, then the EMS program must be modified.

In addition to using VisiPlot and VisiTrend to plot the "Host Historical Data," Carl uses VisiCalc to develop his energy "What if..." program. A customer can visualize what will happen to energy costs if he or she creates a new wing, installs insulation or replaces a furnace.

Priorities

Carl takes many factors into account when he installs an energy management system. In a hotel, for example, guest comfort is accorded first priority. "You've got to look for the nonessential load-consuming devices that are not going to affect the environment drastically," says Carl. "For example," he explains, "extra lighting and fans can be shut down at times of peak energy demand. However, you must be careful not to be so aggressive in energy management that you sacrifice environmental comfort. It's really a fine line."

Carl also believes it is imperative

that nothing be done that would slow down a customer's production. To do so would be "throwing the baby out with the bath." For example, you can't "duty cycle" or routinely shut down an ice cream store's freezers or cut off hot water heaters in a laundromat. Though energy control is necessary to reduce utility costs and increase profits, businesses must still be able to function normally.

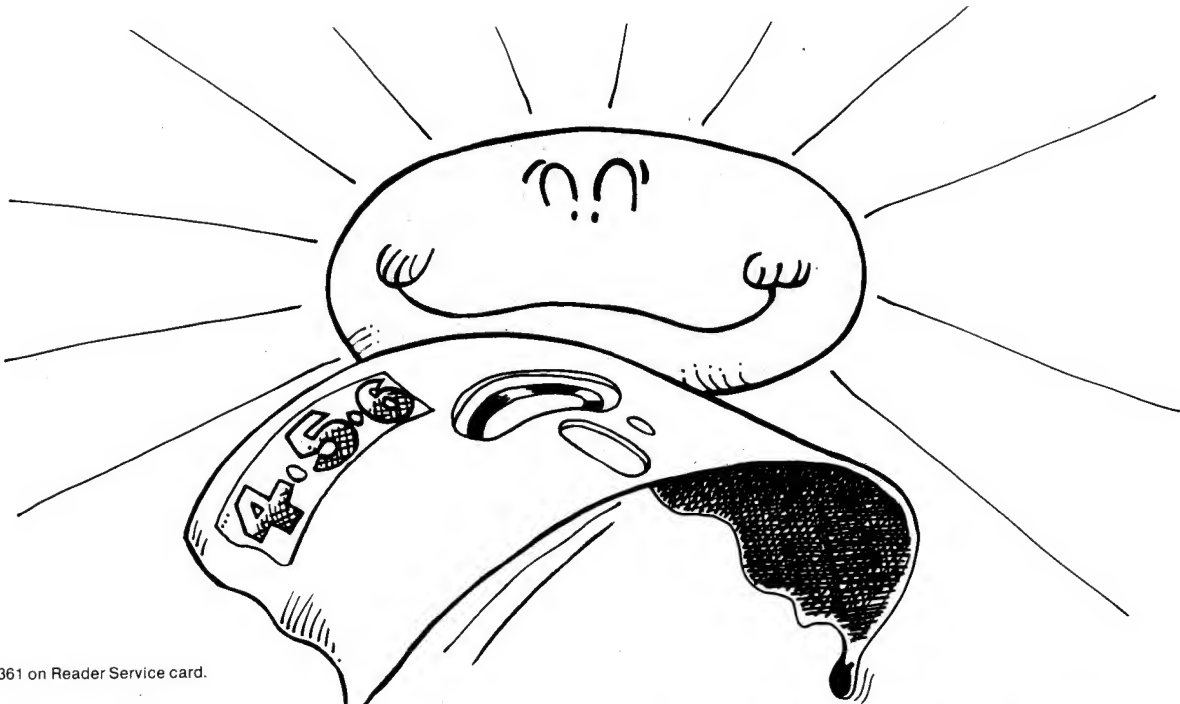
The Savings

What potential savings does an EMS offer? It depends largely on the type of industry or business involved. Because it cannot shut off lights and deep fryers at peak energy times, the pay-back time for a fast food facility could be as long as two years. Hotels, however, are able to take greater advantage of an EMS, and often have a pay-back time of six months. Thereafter, an EMS can save from six to 50 percent of energy costs.

Carl has many success stories. One is the new 602-room Brickell Point Holiday Inn in Miami, Florida. The hotel is cooled by two 260-ton chillers, seven air handlers, and 11 roof units. Florida Power & Light projected a peak demand of 1,750 kw, which Carl felt was extremely high. After installing a comprehensive energy management system, the hotel owners saw results. During the first two months of operation, the hotel's energy demand never exceeded 998 kw. Brickell Point Holiday Inn became the first hotel system in Dade County to meet Florida's energy code. Good news travels fast. Carl was recently asked to install a similar energy management system in the new Airport Regency Hotel, also located in Miami.

Presently only about six percent of existing structures have energy management systems. Though some such systems are being used in homes, initial costs are still too high to be practical for most homeowners. However, Carl believes the day will come when all residential and commercial establishments will have some form of computerized energy management.

Write Carl Rutherford at Energy Conservation Controls Inc., 3970 Thurmond Road, PO Box 808, Conley, GA 30027. ■



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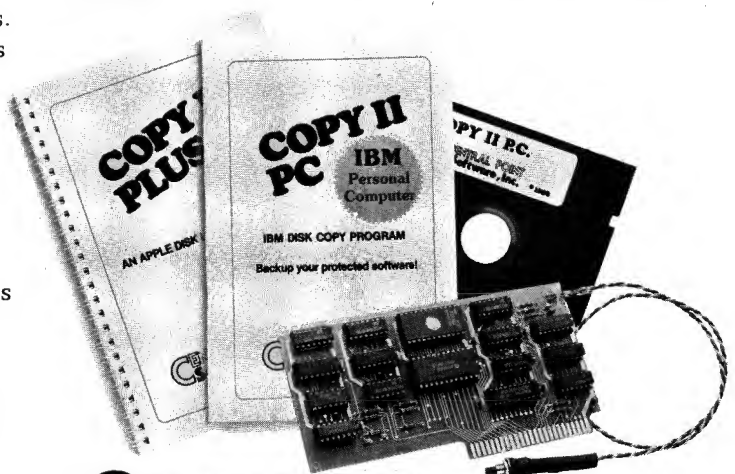
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The Alternative Apple

Taking your Apple canoeing may seem like a wild idea. But with a battery and an inverter you could do it.

by John Davidson

No discussion of computers and alternative energy would be complete without considering the idea of running the computer itself from an alternative energy source. With the small power consumption and low voltages required by modern microcomputers such as the Apple, battery operation is completely practical.

Two places where battery operation would be desirable come immediately to mind: in homes without regular electric service, and for portable use, as in a vehicle or during some kinds of field work such as surveying.

A third possible use for battery operation might be for long critical file handling operations in areas where the commercial power is unreliable, although power from the grid is available most of the time and can be used to maintain a storage battery.

A fourth suggestion is to run the computer on alternative power to free it from the power grid and save on the electric bill, but I doubt that I'd bother; my last calculation showed a payback of just over 104.7 years. Of course, if the electric rates increase enough, that might drop to as little as 75 or 80 years!

There are many ways of providing power without the help of the local utility—windmill, solar, water wheel,

thermopile, a human (or animal) powered generator, and so forth. The problem with most of these is that they may not be reliable from hour to hour or day to day. Thus you need intermediate storage. The obvious choice would be a 12-volt automobile or motorcycle battery. Sounds easy.

Battery Storage

Actually, the question of batteries rates more than just a cursory glance. Once upon a time a storage battery was a storage battery. No more. In the modern age of super-specialization and ultra-engineering, the "ordinary" automobile storage battery is optimized for just one "worst case" task: getting the car started on a really frosty northern morning.

The marine/recreational vehicle (deep cycle) storage battery, on the other hand, is designed to accommodate moderate loads for long periods, while doing poorly with high amperage engine starting currents. Thus, the

John Davidson is a physicist and professional engineer with a penchant for writing. He has been involved with microcomputers since 1975, including designing his own systems. He has also been an editorial adviser for this feature issue of inCider. You can write him in Marlow, NH 03456.





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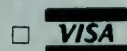
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deep cycle battery is the hands-down choice for running a computer (a low to moderate load) for a relatively long time.

There is one qualification to this, and it involves cost effectiveness. Automobile storage batteries are often replaced at the first hint of a problem, and though many of these batteries still have life in them, they are generally junked. You can often pick up one or two at a friendly gas station for the junk price, and my experience at rehabilitation with a low (2 to 4 amp) charging rate has been generally good.

If you don't mind lugging batteries around and you can coddle the battery through a few cycles of useful work, you are ahead. If the junk battery price goes up while you are using it, you may even make a modest profit.

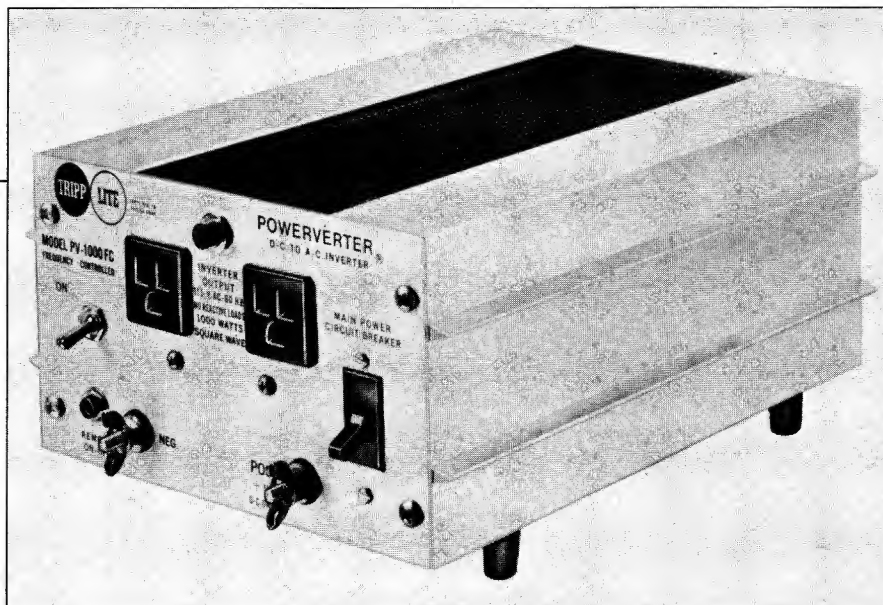
Two Power Alternatives

You now have a choice of two viable methods for powering the computer from the 12-volt battery: use a solid-state inverter to create 117-volt AC for the Apple and its peripherals without further ado; or arrange the electronics to provide the required DC voltages directly, bypassing the 117-volt power supplies. The first approach is quick and easy—you needn't even remove the top of the computer. The second approach is a bit cheaper, lighter in weight, and will yield more computing time from equivalently charged batteries (or reduce the charging requirements for comparable operating times), but it requires considerable hardware hacking. So, let's look at the first approach.

The Inverter

All you really need is a store-bought gadget, the direct current to 117-volt alternating current inverter. These all use a storage battery, usually 12 volts in this current range, and come in three "flavors" with commensurate prices. Top-of-the-line is the *uninterruptable power supply* (UPS). The UPS plugs into the wall and maintains its storage battery on charge automatically (full or trickle, as necessary) as long as the AC mains (utility) power is available. Meanwhile, the computer is running on mains power.

On failure of the mains, the UPS



switches to its battery automatically in less time than it takes to tell, the computer doesn't know the difference, and the battery continues the operation for a specified time depending on battery size and load. When power returns, the computer (still oblivious) is switched back, and the battery is simultaneously recharged. It's a good system—the UPS really delivers. It is expensive, but the price generally includes a good, high-tech battery.

Not quite as posh, but certainly serviceable, is the combination inverter and battery charger. Its operation is similar to that above, but you do the switching. Unless you have reflexes like lightning (or perhaps a bit faster), the computer will see the glitch when the mains power fails and go down, but, after you light your candle, you're back in business.

The last approach, the simple inverter, merely provides alternating current from the battery. You defend yourself on keeping the battery

charged. (If you don't have mains power available most of the time, the battery charging feature of the first two devices mentioned will be wasted anyway.) I'm going to address this last device, although most of the discussion is applicable to all.

Are Frequency and Wave Shape Important?

There are two issues you'll see raised in connection with solid-state inverters: frequency control and wave shape. For most computer equipment a stable frequency is not necessary, *unless the AC is driving a motor whose rotational speed is critical*. Common examples of AC-driven speed-critical motors are those in most 8-inch disk drives and model 35 and earlier Teletype printers. Of course, frequency controlled inverters are available at a premium.

Many low-cost inverters produce a square wave, not the sine wave furnished by the power company. This

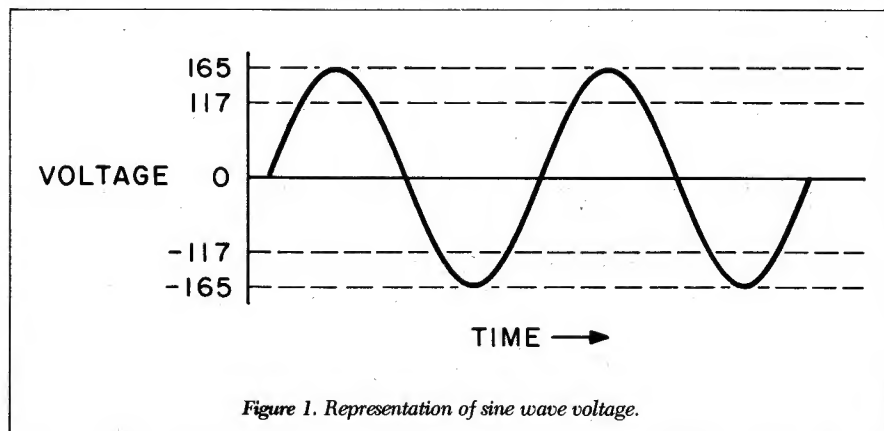
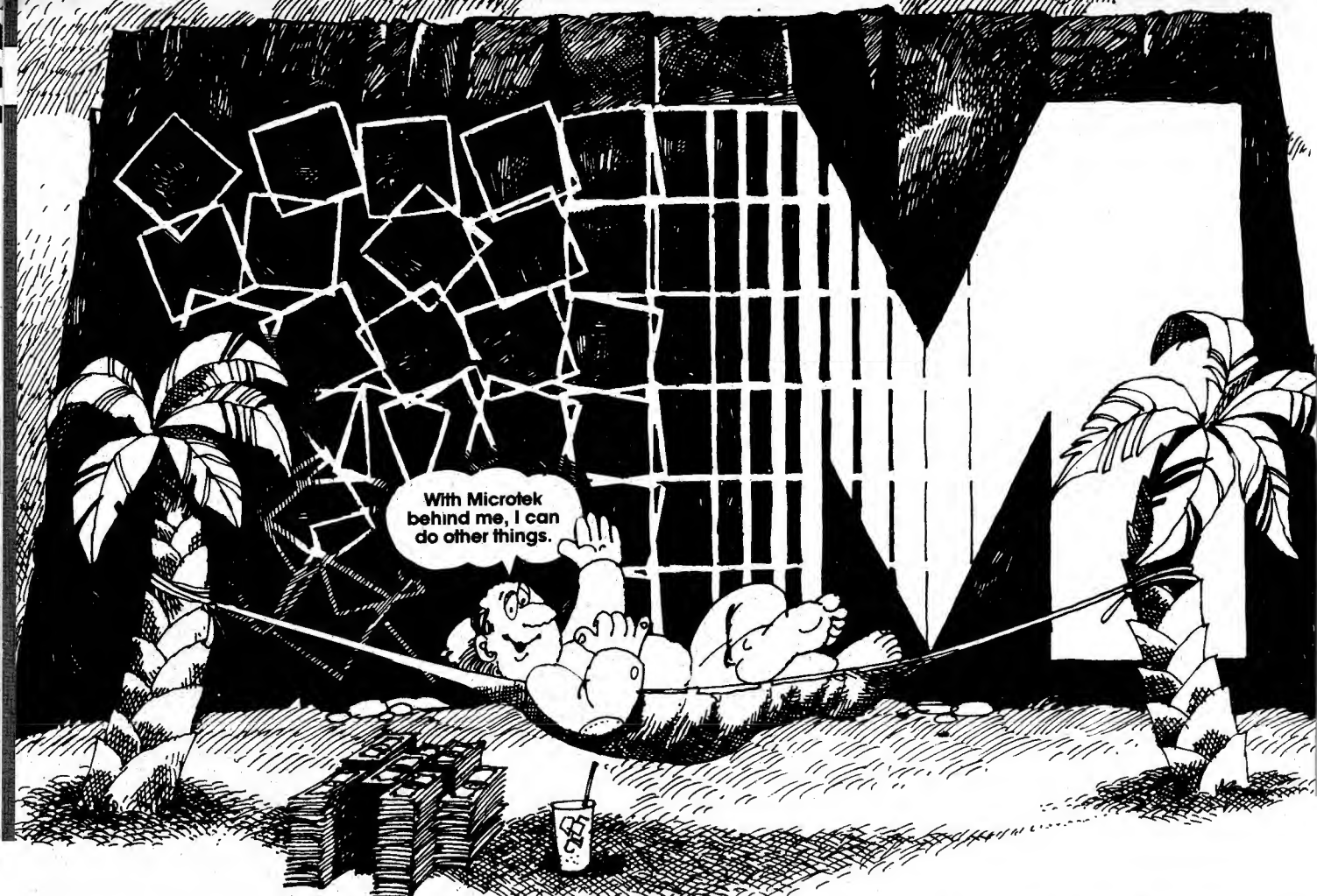


Figure 1. Representation of sine wave voltage.



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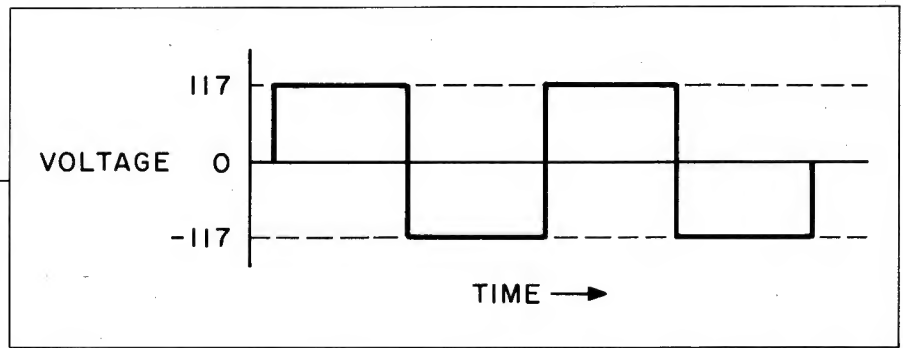
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Figure 2.
Representation of square wave voltage.



has two main implications (aside from changing the mathematics of analysis). First, the actual voltage does not change during a half cycle the way sine wave AC does. Thus, SCRs, Triacs, and other devices that trigger on a certain voltage level will be befuddled, and light dimmers or motor speed controls based on these devices will not work properly.

The second difference is that the peak voltage will be lower. A reasonable response to this statement would be, "Huh! 117 volts is 117 volts, isn't it?!" Not quite. Take a look at Figures 1 and 2. When an electrician (or your friendly utility) speaks of alternating current voltages, he's talking *root mean square*, or RMS, but the voltage is actually higher (by a factor of the square root of two, or 1.4142) than the stated value for a brief instant twice during each cycle.

The magic of the RMS nomenclature and the $\sqrt{2}$ factor is that an RMS voltage has the same heating (or lighting) value (power) as the equivalent voltage of direct current. Think of it as the part above the actual RMS voltage "filling in" the lower voltage areas between the RMS and the zero crossing. (The squaring is done to avoid the mathematical problem of the true average voltage of one cycle of AC being zero.)

Because the square wave does not reach as high a peak value, a lightly loaded, unregulated power supply (where a filter capacitor is charged by the AC peak) may not develop quite as high an output voltage with the square wave as it would with a sine wave. Computer power supplies are always regulated and usually can accommodate this drop if it occurs.

How Much Power Do You Really Need?

Your first consideration in choosing an inverter is determining your actual power requirement. The rules of the Underwriters Laboratories make this a simple task. List all the equipment you want to work with your battery-powered computer system. Now, note the items that normally plug into the wall. (Apple disk drives derive their power from the Apple, not the wall, thus would not be counted.)

Inspect the UL-required specification markings on each of these wall-plug devices and note the power requirement, usually in watts, but occasionally in amperes. Add the wattage

figures. (Convert amps at 117 volts AC to watts by multiplying by 117 before adding.)

This, then, is your actual wattage requirement in the here and now. Fu-

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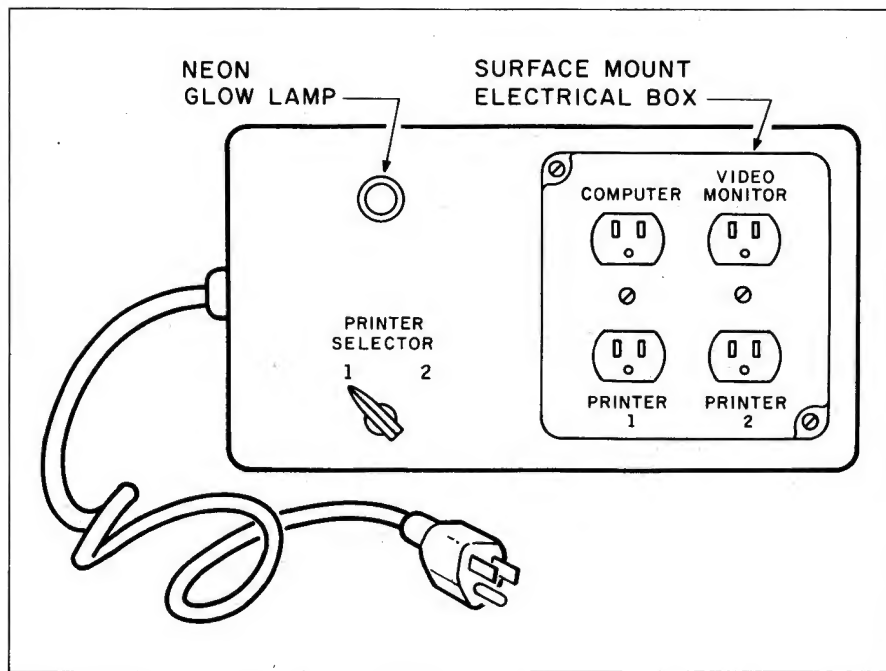


Figure 3.
Sample line filter with multiple-outlet box and selector switch. Modify for your own needs.

ture expansion? Check the labels on other equipment at your dealer's if you expect to add it during the life of your inverter or your system. Of course, you only need consider equipment that will be operating simultaneously.

For example, I have three different printers. My system won't drive more than one at a time without tricks, so there's no need to have more than one turned on at a time. I use the highest of the three printer consumption figures. (Then, of course, I must make sure only one is turned on at a time.) Add 10 to 20 percent "for good measure" and a margin of safety, and go with the lowest-power 117-volt inverter that matches or exceeds that wattage. (Overgunning will do no harm, but it increases cost and weight.)

Power Protection

According to the inverter manufacturers, that's all there is to it; add a grounding multiple-outlet adaptor from your friendly neighborhood hardware store, and you're on your way. Of course, in their next breaths (in the fine print) they disclaim all responsibility for any problem. Being a cautious soul, I'd like to see a bit of protection between the inverter and the computing equipment, and the filter described in "Line Cleaner—A Construction Project" in the August 1983 *inCider* (pages 108–110) is just the ticket.

Please note that an error occurred in the schematic diagram with that article. A correction was published in the September 1983 *inCider* (page 10), but

I'll repeat it here. The schematic showed a two-wire cable and outlet to feed the computer and did not carry the ground beyond the rfi filter module. The computer cable should have been shown as three-wire, with the ground (green wire) connected to the other ground wires and the hot (black) and neutral (white) wires going straight through the filter.

There are three small modifications to the line cleaner project I'd like to suggest for this use: I'd mount several outlets in the face of the box rather than coming out on a cord and single outlet; I'd substitute a 117-volt neon lamp for the LED for a slightly lower power consumption; and I'd use a metal box for better shielding and protection. Standard electrical boxes are available in a wide variety of sizes and shapes at your local electrical supply outlet.

Also, if your system does include several different components that will be used at different times (like my printers) you might consider a selector switch that will power any one of the outlets that these devices will use. Then, even in the face of absent-mindedness, you *can't* power up more than one at a time.

This switch must, of course, be rated for 117-volt service and should switch only the hot (black) wire. Neutral (the white wire) and ground (the green wire) should never be switched. These code colors apply to 117-volt AC household wiring only. Once you get past the AC power supply in any piece of electronic equipment, it's a brand

new ball game with completely different (and often arbitrary) color codes.

When working on this project, remember that 117-volt AC bites (if power is applied) and it can start fires, whether it comes from a wall plug or an inverter. Be sure to separate and insulate all conductors, and see that all wires are firmly attached, by screws, by crimping, or by soldering.

A sketch of one version of this box is shown in Figure 3. The outlets can be mounted in holes cut in the front panel using either the "drill and file" technique or an Adel nibbling tool. An easier way would be to bolt one or more surface mount outlet boxes to the front panel, bringing the wires through large holes behind knockouts in the backs of the boxes.

Use a smooth electrical fitting or a rubber grommet to protect the wires from the sharp metal edges, and be sure to use strain relief on the power cord where it enters the box. You could fuse or breaker-protect this box, but as inverters are current-limiting by nature (when overloaded, the output drops) it doesn't seem necessary.

Further Illumination

When computing, you may need a close, bright light, either to read data or to keep track of manuals and references. You *can* use the battery for that also, but if so, give it some thought. Regular 117-volt lamps devour energy (and give off heat) like mad.

If you must have electric light, look into 12-volt lighting; it's available for boats and recreational vehicles. Also, don't forget the high-intensity lights such as the Tensor that were a rage several years ago. Most of these use a 12-volt lamp and only need the transformer removed. Either way, watch the wattage. Of course, then there's the nice contrast of the solid-state, high technology of your Apple basking in the gentle glow of a kerosene lamp.

How Long Will It Run Between Charges?

The operating time you will enjoy between full charges of the storage battery depends on the type, size, age, and temperature of the battery, and, of course, the load imposed by the

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computer and its peripherals, as well as any lights that you may also be running from the battery. For the deep cycle type battery, divide the average current consumption of your computer (in amps) into the manufacturer's

amp-hour rating of the battery you are using. (If you don't know the consumption of your computer, use 5 to 6 amps as a "guesstimate.")

The resulting time in hours takes you to the absolute bitter end for a new battery at 80° F. If the battery is at 32° F, you'll get only 65 percent of that. For a more realistic figure, use 75 to 80 percent of the value obtained above. From an automobile battery of equivalent size, expect to get about one quarter of the operating time of the deep cycle, and not nearly as many charge/discharge cycles.

For example, using Sears, Roebuck's little 32 amp-hour 9601 Deep Cycle RV/Marine DieHard with a load of 5 amps, at 80° F you'd have a bitter end of 6.4 hours, with a probable useful charge duration of about five hours. If the battery were cooled to freezing, you'd expect to get about 3¼ hours of operation between charges. The larger Sears, Roebuck 9650 would yield about 20 hours at 80° F, and 12 hours if the battery were at freezing temperature.

When it comes to recharging, expect to put in 1¼ to 1½ amp-hours for each amp-hour taken out. Because the deep cycle batteries are less tolerant of overcharging than automotive batteries, keep close track of your battery's specific gravity. For a while, at least, a battery checker such as American Optical's Duo-Check or a float-type hydrometer should be your best friend.

Sailing On

Running an Apple on direct current is certainly practical today. As computers become more portable and alternative energy sources more common, this option should become increasingly attractive. Then, after you've charged a battery from your photovoltaic cells, wind mill or water wheel, you'll be able to pile everything into the canoe, hand the Apple its paddle, and off you'll go. ■

I acknowledge with thanks the assistance provided by James McGilvery of Sears, Roebuck and Company, Keene, NH; Daniel Osmer of Micro Services of New England Inc., Keene, NH; and particularly the inspiration, design review, and technical critique of Arthur J. Pennell, Upland Service, Lexington, MA. JD

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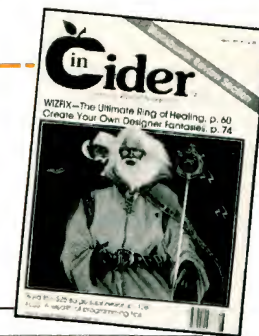
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Musical scale. A scale is simply the choice of notes available for the melody. This can range from one note to 12, or even more, in an octave. The scale helps determine the "mood" of a

piece. Controlling the scale goes a long way toward creating pleasant music on the computer. Tunes based on the chromatic scale (using all 12 semitones in the octave) appear dissonant and musically neutral. This is one reason for the distasteful sound produced by most algorithms.

Melody. The big problem, once we define a scale, is choosing the actual notes. The most primitive method is simply random pitches. You have probably seen many programs with something like:

$P = \text{INT}(\text{RND}(1) * 255)$

as the basis. This produces what is known as "white melodies"—notes having no relation to one another. White melodies have very little appeal. The brain finds no kind of connection necessary to please it. Figure 1 shows a typical white melody generated by adding together ten dice for each note. We do impose a little order on the whiteness by forcing it to have a normal distribution.

You can write to Jonathan Kandell at 10677
Creeknoll Ct., Cincinnati, OH 45242.



by Jonathan Kandell

The Fundamental Issue

Now that we have rejected white melodies, we are ready to face the crux of the problem—what separates music from noise? The maximum pleasure, in music as well as in other arts, is probably somewhere between the extremes of total randomness and total predictability. To be more exact, the most ordered state is boring, and becomes more aesthetically appealing as more disorder is introduced, up to a point of confusion. But how can we achieve this?

The obvious method is to limit the

random jumps of white notes to a certain interval, usually less than five semitones. If the last pitch was 10, then the next can range from 5 to 15. This kind of sound is termed “brown music,” due to the similarity with Brownian movement in chemistry. Figure 1 also gives an example of brown noise. This definitely sounds different from white, yet is still not appealing. It wanders aimlessly, lacking bounce and body. It is hard to find an overall continuity because it is still white in the long run.

Another technique that has been used

is “stochastic” music, a term coined by its chief advocate Iannis Xenakis. The basis of stochastic music is statistical analysis. The random notes are controlled by probability rules input by the user. It is really just a much more complicated form of brown music. To be really good, stochastic music requires many rules—Xenakis uses probability calculus. Attempts that have used fewer rules run into the same problem as brown tunes: While the music may sound nice over a short span of four or five notes, it is still “white” over the whole, thus unap-

```

1 GOSUB 700: GOTO 500
10 FOR I = 1 TO 10: A(I) = INT (
  6 * RND (1)) + 1: C(I) = INT
  ( RND (1) * 6) + 1: NEXT
20 N = X
30 FOR I = 10 TO 1 STEP - 1
40 A = INT (N / 2): B(I) = N - A *
  2
50 N = A
60 NEXT I
70 FOR I = 1 TO 10: IF B(I) < >
  BO(I) THEN A(I) = INT ( RND
  (1) * 6) + 1: C(I) = INT ( RND
  (1) * 6) + 1
80 NEXT I
90 P = 0: D = 0: FOR I = 1 TO 10: P
  = P + A(I): D = D + C(I): NEXT
100 P = P - PT: IF P < 0 THEN P =
  P + PO
110 IF P > PN THEN P = P - PO
120 IF D < 20 THEN D = 1: GOTO 1
  90
130 IF D < 36 THEN D = 2: GOTO 1
  90
140 IF D < 44 THEN D = 3: GOTO 1
  90
150 IF D < 52 THEN D = 4: GOTO 1
  90
160 D = 5
190 NN(X,0) = N(P): NN(X,1) = INT
  (DU(D) / 255) + 1: NN(X,2) =
  DU(D) - ((NN(X,1) - 1) * 255
  )
200 HTAB 19: VTAB 11: PRINT X
210 FOR I = 1 TO 10: BO(I) = B(I)
  : NEXT
220 X = X + 1: IF X = 1025 THEN 3
  00
230 IF PEEK ( - 16384) > 127 THEN
  POKE - 16386,0: VTAB 17: INPUT
  "DO YOU WANT TO CONTINUE COM
  PILATION?": AN$: ON AN$ = "N"
  GOTO 300: VTAB 17: PRINT "
  ": REM 30 SPACE
  IN QUOTATIONS
240 GOTO 20
300 FOR I = 0 TO X - 1
310 POKE 768,NN(I,0): POKE 769,N
  N(I,1): POKE 770,NN(I,2): CALL
  771
320 NEXT
350 HOME : VTAB 10
400 INPUT "LOAD WHICH SCALE? ": N
  AS
401 GOSUB 730
402 SP$ = "": INPUT "F, N, OR S?"
  : SP$: IF SP$ = "S" THEN KK =
  1.5
403 IF SP$ = "F" THEN KK = .6
404 IF SP$ = "N" THEN KK = 1
405 FOR I = 1 TO 5: DU(I) = DU(I)
  * KK: NEXT
408 X = 0: IF NA$ = "" THEN 460
410 ONERR GOTO 1000
420 PRINT CHR$(4)"OPEN"NA$: PRINT
  CHR$(4)"READ"NA$
430 INPUT PO,PN
435 PT = 35 - INT ((PN + .5) / 2
  )
440 FOR I = 0 TO PN: INPUT N(I):
  NEXT
445 POKE 216,0
450 PRINT CHR$(4)"CLOSE"
460 HOME : VTAB 4: PRINT "I AM C
  ONSTRUCTING THE COMPOSITION
  TABLE": PRINT
470 GOTO 10
500 HOME : VTAB 6: PRINT "1) LOA
  D SCALE AND PLAY": PRINT : PRINT
  "2) ADD NEW SCALES": GET AN$
  : ON VAL (AN$) GOTO 350,510
502 GOTO 500
510 HOME : VTAB 3: INPUT "NAME O
  F SCALE? ": NA$
515 PN = 0
520 PRINT : INPUT "NUMBER OF NOT
  ES PER OCTAVE? ": PO
540 PRINT : PRINT "ENTER NOTES I
  N SCALE FROM LOWEST TO H
  IGHEST. USE '/' WHEN FINISH
  ED...": PRINT
550 INPUT N$: IF N$ = "/" THEN P
  N = PN - 1: GOTO 590
560 N(PN) = VAL (N$): PN = PN + 1
570 GOTO 550
590 PRINT : PRINT "HIT RETURN TO
  SAVE "NA$" TO DISK": INPUT
  AN$
600 PRINT CHR$(4)"OPEN"NA$: PRINT
  CHR$(4)"WRITE"NA$:
620 PRINT PO: PRINT PN
630 FOR I = 0 TO PN: PRINT N(I):
  NEXT
640 PRINT CHR$(4)"CLOSE"
650 PRINT : INPUT "DO ANOTHER SC
  ALE? ": AN$: ON AN$ = "Y" GOTO
  510: END
700 DIM NN(1024,2),N(50)
705 KK = 1
710 FOR I = 771 TO 796: READ P: POKE
  I,P: NEXT : RETURN
715 REM
  SOUND ROUTINE BY
  BOB HANSON
716 REM PUBLISHED IN MARCH 1983
  CALL APPLE
720 DATA 173,48,192,136,208,5,
  206,2,3,240,9,202,208,245,17
  4,0,3,184,80,236,206,1,3,208
  ,234,96
730 DU(1) = 38: DU(2) = 83: DU(3) =
  173: DU(4) = 353: DU(5) = 713
740 RETURN
1000 PRINT CHR$(4)"DELETE"NA$:
  PRINT CHR$(4)"CATALOG": GOTO
  400

```

Program listing. BASE.

pealing. We will use a simpler technique that takes advantage of a subtle statistical fact about the world.

Fractal Curves

Some of the most precise work in the mathematics of aesthetics has been done by two mathematicians, Benoit Mandelbrot and Richard F. Voss at the Wagner Institute. Their work concerns the study of fluctuating data exhibiting a $1/f$ spectral density. While the mathematics is complicated, the concept can be explained quite simply: Curves having a $1/f$ spectral density look the same no matter how closely we examine them—the part is related to the whole. Statistically, $1/f$ curves vary in randomness between white and brown curves. See Figure 1 again.

Mandelbrot, in his *Fractals: Form, Chance and Dimension*, first recognized the large occurrence of $1/f$ curves in nature. He found them in fluctuations in river levels, shapes of flickering flames, gnarled branches of trees, coastlines, star clusters, clouds, variations in sunspots, the wobbling of the earth about its axis, undersea currents, and traffic flow. Voss wondered whether good music exhibited this same tendency, and found that all types of music do indeed have $1/f$ distribution.

One method of creating $1/f$ music is by using data having $1/f$ characteristics. Voss himself used transistor residuals for his music studies. Other composers have used patterns from nature without realizing Voss's mathematics. Charles Dodge used fluctuations in the

earth's magnetic field to create a beautiful work. Most natural patterns, however, are too brown to provide a basis for musical composition.

Can $1/f$ curves be generated from scratch by computer? In the "Mathematical Puzzles and Games" column of the April, 1978 *Scientific American*, Voss offers just such a method. Despite the complicated mathematics of the curves themselves, the method is relatively simple. The listed program uses a computerized version of this method as its base.

**"Curves having a
 $1/f$ spectral density
look the same
no matter how closely
we examine them."**

Duration. Lastly, we have duration, or length of notes. We will vary the duration with a $1/f$ curve also.

The Program

Refer now to the program listing. Line 1 jumps to the initialization routine that pokes the sound output data. The routine I used is a version of the old system master routine, Lemonade Stand, modified by Bob Hanson in the March, 1983 *Call-A.P.P.L.E.* to allow durations longer than 255. Bob very graciously allowed me to use his routine.

After initialization, we jump to the menu at 500, offering the load and play or add scale functions. Figure 2 lists some scales I have developed. If you wish to build your own scales, consult Figure 3 for the pitch values of the notes.

After loading a scale, you will be asked to choose a tempo: fast, normal, or slow. For both the scale and tempo questions, press return to default to the previously-typed answer. If $X=0$ is removed from line 408, then a tune can be composed using a mixture of scales.

The heart of the algorithm lies in

Figure 1.
Melodic outlines of three kinds of music.

lines 10-240. Voss's 1/f generation technique consists of assigning a die to each figure in a binary number of given digits (ten in our case). The pitch is the sum of these dice. The binary number is incremented through a given cycle (1024 here). The die representing any digit that changes during the increment is rethrown, and all dice are summed again to get the new pitch. It becomes evident why 1/f curves combine chance with stability: The digits/dice further left change less often, while those on the right change more frequently.

In our program we have the computer throw the dice originally in line 10 for both the pitch, A(*), and duration, C(*). Lines 20-60 convert a number, X, into binary. In line 70 we compare each digit with its previous condition (1 or 0) and rethrow dice for any differences we discover.

Line 90 sums the dice for both pitch and duration. We now must test the pitch to see that it stays within the limits of our sound routine. We first translate it down PT semitones in order to correlate the P range (10-60) to our scale range. Lines 120-160 convert the duration, D, into one of five units.

Both of these are now entered in the composition array. NN(X,0) is the pitch. NN(X,1) is the duration MOD 255. NN(X,2) is the duration.

All that is left to do is put the current digits into the old digit array, and increment X. A routine at 230 allows the process to be stopped if the user gets bored.

Lines 510-650 add new scales to the disk in the form of text files. The routine is pretty self-evident. I might mention that the number of notes per octave does not include the repeat of the first note an octave higher. The chromatic scale, for example, has 11 notes per octave.

A Couple of Catches

The foremost defect of this program is slowness. The computer rolls dice faster than Superman, yet it can still be tiresome to wait for a thousand notes to be constructed. Therefore, I can't urge you enough to compile the program! It makes the program so much more enjoyable that, if you don't own a compiler, send me a blank disk with

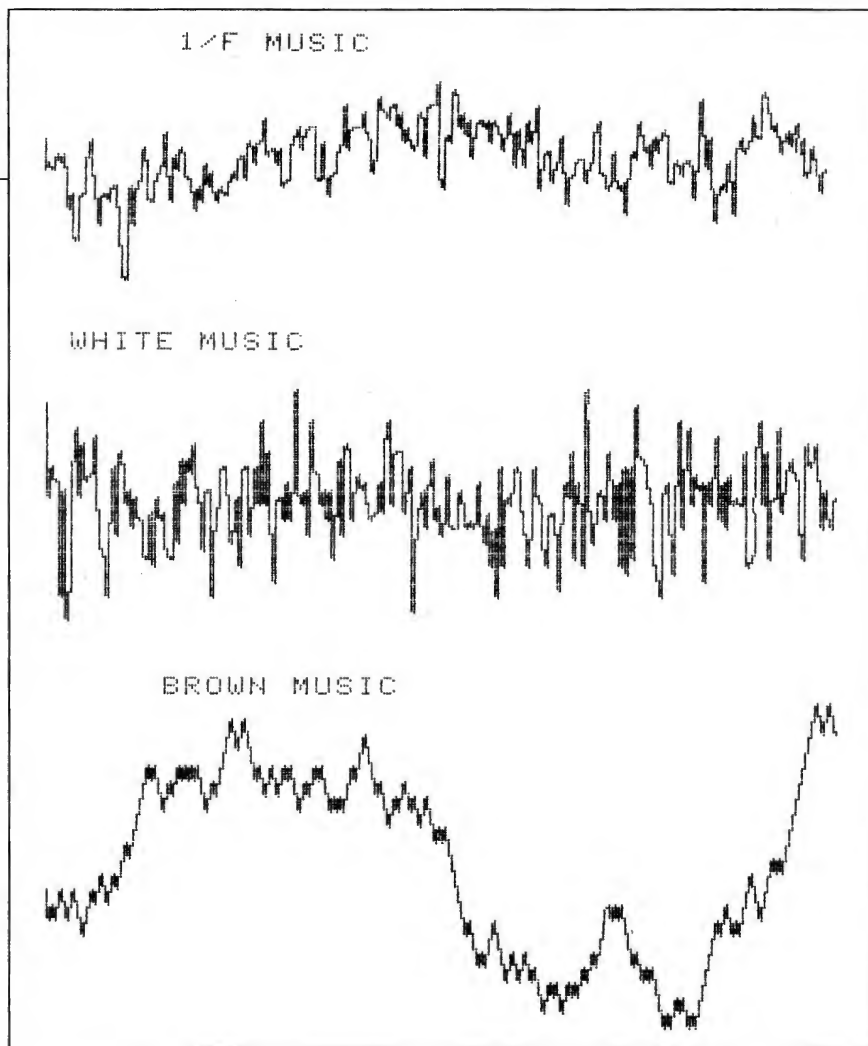


Figure 2. Pitch values for 14 scales.

SCALE	NO./OCT.	PITCHES
Chromatic	11	same as figure 3
G major	7	255 228 204 192 172 152 136 128 115 102 96 86 76 68 64 57 50 47 42 37 33 31
G Aeolian	7	255 228 216 192 172 162 145 128 115 108 96 86 81 72 64 57 53 47 42 40 35 31
G Mixolydian	7	255 228 204 192 172 152 145 128 115 102 96 86 76 72 64 57 51 47 42 37 35 31
G Lydian	7	255 228 204 182 172 152 136 128 115 102 91 86 76 68 64 57 51 45 42 37 33 31
G Phrygian	7	255 242 216 192 172 162 145 128 121 108 96 86 81 72 64 60 53 47 42 40 35 31

Figure 2 continued.

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Figure 2 continued.

G Dorian	7	255	228	216	192	172	152	145
		128	115	108	96	86	76	72
		64	57	53	47	42	37	35
		31						
Mediterranean 1	7	255	228	216	182	172	152	145
		128	115	108	91	86	76	72
		64	57	53	45	42	37	35
		31						
Mediterranean 2	7	255	242	204	192	172	162	145
		128	121	102	96	86	81	72
		64	60	50	47	42	40	35
		31						
Mediterranean 3	5	255	216	192	172	145		
		128	121	96	86	72		
		64	53	47	42	35		
		31						
Hexascale	6	255	228	216	192	172	145	
		128	115	108	96	86	72	
		64	57	53	47	42	35	
		31						
Chinese	5	255	228	204	172	152		
		128	115	102	86	76		
		64	57	50	42	37		
		31						
Indian 1	5	255	204	192	172	145		
		128	102	96	86	72		
		64	51	48	42	35		
		31						
Indian 2	7	255	242	204	192	172	162	136
		128	121	102	96	86	81	68
		64	60	50	48	42	40	33
		31						

an SASE, and I will send you a compiled version free of charge.

Please remember that this program just touches the surface. The music it produces will never sound as nice as Beethoven because, while our 1/f curves make it statistically more pleasant than both white and brown, we

still cannot make a program that captures the "magic" of musical genius. Perhaps it is best that we can't.

Even so, the program surprises me sometimes. Much investigation can be done in combining 1/f with stochastic rules. Please write me if you come upon some interesting results! ■

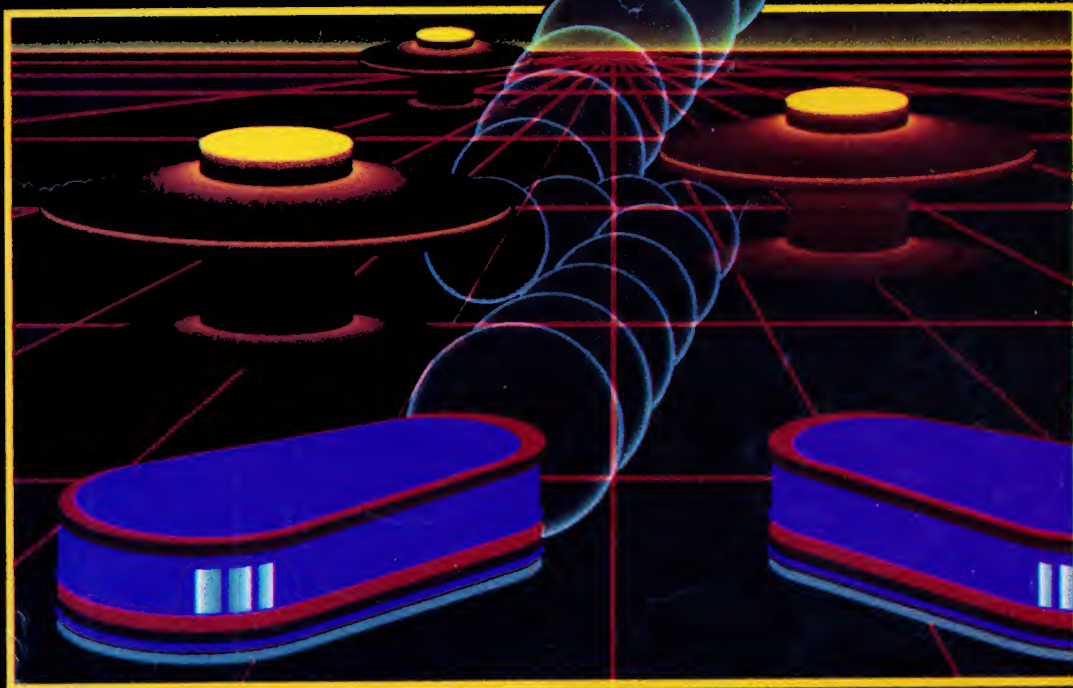
G	=	128	G	=	64	G	=	31
F#/Gb	=	136	F#/Gb	=	68	F#/Gb	=	33
F	=	145	F	=	72	F	=	35
E	=	152	E	=	76	E	=	37
D#/Eb	=	162	D#/Eb	=	81	D#/Eb	=	40
D	=	172	D	=	86	D	=	42
C#/Db	=	182	C#/Db	=	91	C#/Db	=	45
C	=	192	C	=	96	C	=	47
B	=	204	B	=	102	B	=	51
A#/Bb	=	216	A#/Bb	=	108	A#/Bb	=	53
A	=	228	A	=	115	A	=	57
G#/Ab	=	242	G#/Ab	=	121	G#/Ab	=	60
G	=	255	G	=	128	G	=	64

Figure 3. Pitch values for the chromatic scale.

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The second column is the number of sectors on the disk used by the program.

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- A 014 Calorie Rqmts

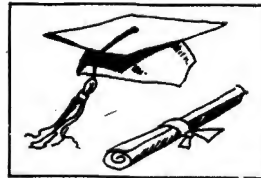
- A 029 Food Values
- A 033 Ideal Body Weight
- A 031 Life Expectancy
- I 026 Life Expectancy Test
- A 017 Metric Kitchen
- A 043 Recipe Box
- T 002 Indexrecipe File
- T 002 Recipe File
- A 042 Recipe Calorie Cost
- A 003 Recipe Cost
- A 026 Recipe Cost Per Serving

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Music & Sound 065

- T 003 America
- I 012 Hanon Etude #1 in C
- T 002 Happy Birthday
- A 015 Harmonic Analysis
- I 019 Music Computer
- I 036 Music Functions
- I 011 Music Gee
- I 023 Music in IB
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- I 017 Music Mozart Theme
- I 007 Music Rigby
- I 026 Music Stairway to Heaven
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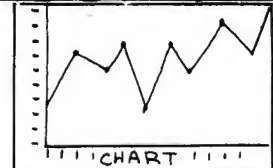
- I 030 Music Two Voices
- I 022 Music Writer 3
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- A 042 Test Maker
- A 019 Test Maker Multi Choice
- I 013 Typing Practice
- A 016 Typing Practice-NW
- A 005 X-Averages
- A 003 X-Date
- T 002 X-E.File
- T 002 X-File
- A 005 X-File Init
- I 009 X-Grading Instr
- I 002 X-Intro Needed
- I 002 X-School Menu Needed
- B 048 X-School 1
- I 002 X-Schoolfile
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- A 005 X-Student Names Grades
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- A 002 Derivative
- A 016 Dfit
- A 011 Differential Eqn Solver Demo
- A 004 Exponential Regression
- A 004 F Distribution
- A 004 Gaussian Quadrature I
- A 003 Geometric Mean
- A 004 Geometric Regression
- A 004 Greatest Common Denominator
- A 005 Histogram
- A 003 Linear Interpolation
- A 007 Linear Programming
- A 004 Linear Regression
- A 005 Mann Whitney U Test
- A 022 Math Drill III
- A 019 Math Multiply Drill
- A 019 Math-NW
- A 013 Matrices
- A 004 Matrix Inversion I
- A 004 Matrix Multiplication
- A 004 Matrix Operation Simple
- A 004 Mean Vari Stdr Devia I
- A 007 Multiple Linear Regression
- A 004 Normal Distribution
- A 006 Nth Order Regression
- A 004 Number Combinations
- A 002 Parabola Plot
- A 003 Permutation Combination I
- A 007 Permutation Combination II
- A 003 Poisson Distribution
- A 006 Polar Equation Plot
- A 011 Polyfit
- A 013 Polynomial Regression
- A 006 Power Curve Fit (c)
- A 003 Prime Factors I
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A 005 Roots of Polynomials
A 004 Simpson's Rule
A 004 Simultaneous Equations
A 004 T Distribution
A 005 T Distribution Test
A 003 Trapezoidal Rule
A 005 Triangle Factors
A 007 Triangle Parts
A 003 Trig Polynomial
A 004 Vector Analysis
A 003 Vector Operations



BUSINESS & FINANCE

Business & Finance 018

A 005 Annuity Principal & Interest
A 003 Annuity Regular Deposits
A 018 Annuity-NW
A 013 Bond Price & Interest
A 012 Bond Value
A 032 Budget Monthly
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A 054 Financial Pak
A 016 Investment Annuity Forecasts
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A 014 Loan Amort Schedule
A 008 Loan Direct Reduction
A 004 Loan Interest
A 029 Market Evaluator Pak
A 009 Mortgage Calculation
A 007 Nicer Writer-NW
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A 007 Sales Tax at 6%
A 017 Security Analysis
A 006 Security Analysis Copy Data
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A 058 Business Finance
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A 020 Household Expenses Profile
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A 029 Inventory Company
A 004 Inventory Cost File Entry
A 016 Inventory Home I
A 022 Inventory Model
A 009 Inventory Print-NW
A 003 Inventory Shortest
A 003 Inventory Shortest Read
A 023 Inventory.
A 003 Inventory.DOC
A 019 Inventory.File Create
A 029 Inventory.File Read
A 018 Stock Market Forecaster
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B 002 Ep1.3
B 002 Ep2.3
B 002 Ep3.3
B 003 Ep4.3
A 002 Epson Catalog Dbl Strike
A 008 Epson Driver Instr
B 002 Epson Driver.
A 002 Epson Greeting
A 004 Epson Labels I
A 005 Epson Labels II
A 006 Epson Labels III
A 002 Epson Lower Case
A 002 Epson MX/FX-80 List Capture
A 008 Epson MX/FX-80 List Format
A 005 Epson MX/FX-80 List Instr.

A 003 Epson MX80 Catalog
A 005 Epson MX80 Demo I
A 007 Epson MX80 Demo II
A 024 Epson MX80 Label Maker I
A 052 Epson MX80 Label Maker II
A 053 Epson MX80 Label Maker III
B 034 Epson MX80 Label.PIC
A 003 Epson MX80 Letterhead
A 015 Epson MX80 Program List
A 023 Epson MX80 Reminder Calendar
A 033 Epson MX80 Setup I
A 033 Epson MX80 Setup II
A 005 Epson Utility 3.3 Demo
A 023 Epson Utility 3.3 Info
A 022 Epson Word Game
A 003 Epson.Exec.Maker.A3.3
I 003 Epson.Exec.Maker.I3.3
B 005 Text.Demo
B 004 Text.MXtest
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Ssserpent

**Ssslide this snake around your screen.
Chase those elusive boxes, but if you
cross yourself, you lossse!**

by Dennis M. Marks

The idea of Serpent is to lead a snake to boxes that appear randomly on-screen. The A, Z and arrow keys control the snake's movement. You earn points and the snake grows when it reaches a box. If the snake hits a wall, runs over itself, or tries to reverse direction, you lose. This may sound easy, but a novice player rarely earns over a few points.

The program works as follows:

Lines 10-60 initialize the shape table and set up the storage area for the coordinates of the snake.

Lines 70-110 draw the walls and initialize variables.

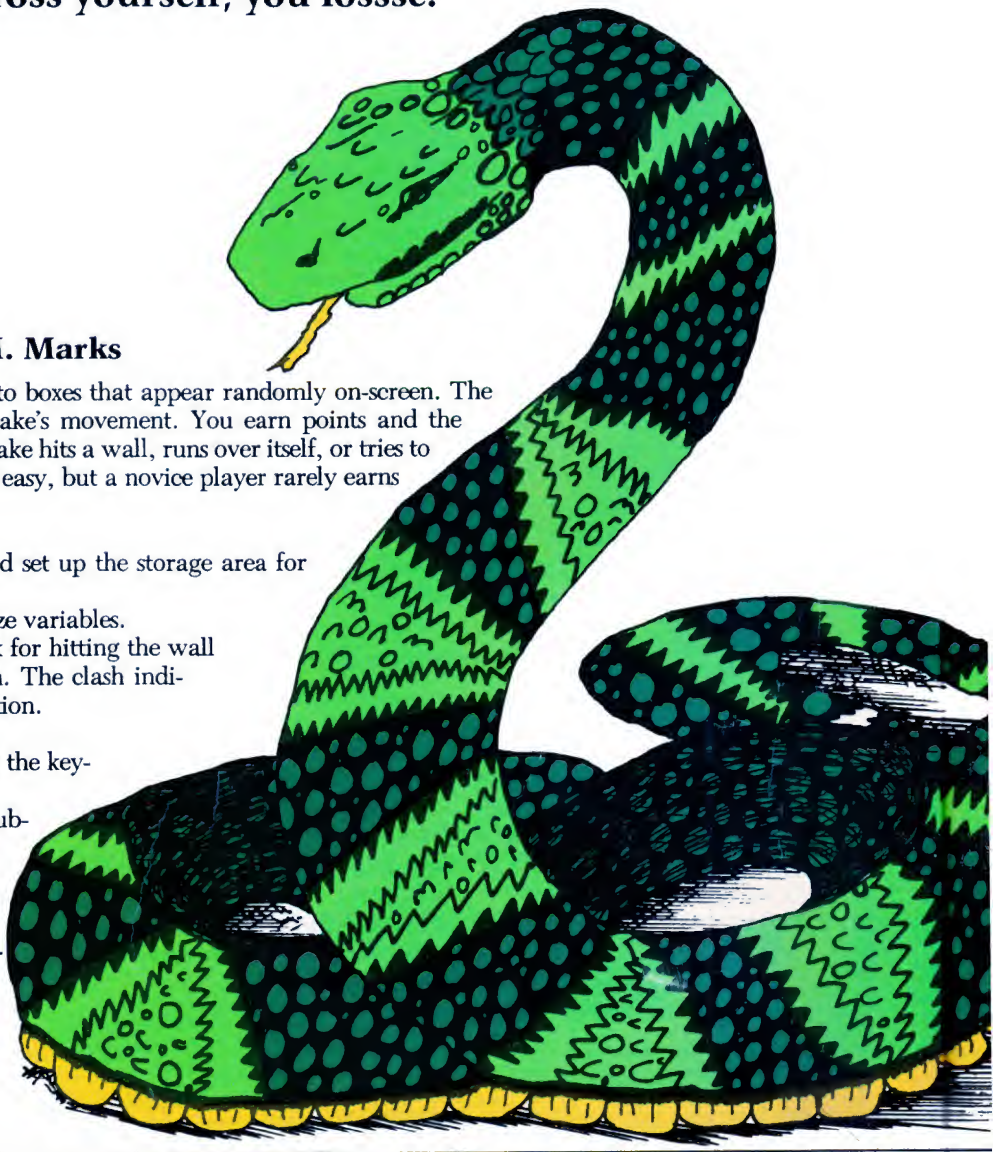
Lines 120-160 move the snake and check for hitting the wall or the snake. Line 140 checks for the clash. The clash indicator values were obtained by experimentation.

Line 170 calls the draw box subroutine.

Lines 180-320 move the snake and check the keyboard for A, Z or arrow keypress.

Lines 330-430 constitute the draw box subroutine. The box is left on the screen for ten cycles and is then repositioned within one to ten cycles. The routine verifies that the box will not be drawn over the snake in line 390.

Lines 440-470 end the game. ■



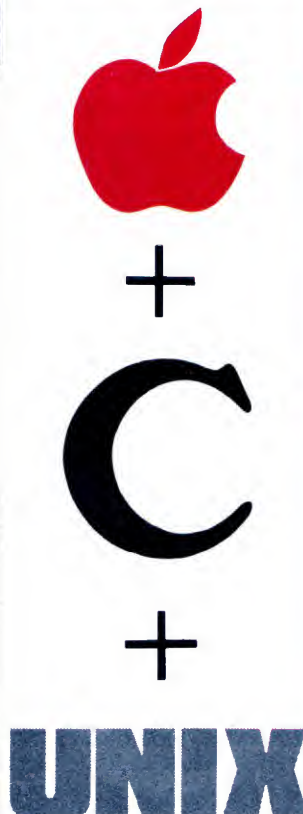
You can write to Dennis M. Marks at 426 W.
Dryden St., Glendale, CA 91202


```

10 HOME : HGR
20 HCOLOR= 3: ROT= 0: SCALE= 1
30 DIM ST$(800,1)
40 FOR X = 1 TO 23: READ P: POKE
   767 + X,P: NEXT
50 DATA 2,0,6,0,13,0,45,53,63,55
   ,45,53,0,45,45,53,54,62,63,6
   ,3,36,36,0
60 POKE 232,0: POKE 233,3
70 FOR X = 72 TO 204 STEP 4: DRAW
   1 AT X,2: NEXT
80 FOR X = 72 TO 204 STEP 4: DRAW
   1 AT X,155: NEXT
90 FOR Y = 3 TO 154 STEP 3: DRAW
   1 AT 72,Y: NEXT
100 FOR Y = 3 TO 154 STEP 3: DRAW
   1 AT 204,Y: NEXT
110 X = 140:Y = 80:L = 1:N = 1:C =
   1:DI = 1
120 ST$(N,0) = X:ST$(N,1) = Y
130 N = N + 1: IF N = 801 THEN N =
   1
140 XDRAW 1 AT X,Y:CL = PEEK (2
   34): XDRAW 1 AT X,Y
150 IF CL = 0 THEN 440
160 IF CL < > 12 THEN PRINT CHR$(
   7):XC = 1:LL = LL + 5:C =
   C + 5: VTAB 23: HTAB 10: PRINT
   "SCORE: ";LL;
170 GOSUB 330
180 DRAW 1 AT X,Y
190 IF C = 0 THEN XDRAW 1 AT ST
   $(L,0),ST$(L,1):L = L + 1: IF
   L = 801 THEN L = 1
200 IF C > 0 THEN C = C - 1
210 K = PEEK ( - 16384)
220 IF K < 128 THEN 280
230 POKE - 16368,0
240 IF K = 193 THEN DI = 1
250 IF K = 149 THEN DI = 2
260 IF K = 218 THEN DI = 3
270 IF K = 136 THEN DI = 4
280 IF DI = 1 THEN Y = Y - 3
290 IF DI = 2 THEN X = X + 4
300 IF DI = 3 THEN Y = Y + 3
310 IF DI = 4 THEN X = X - 4
320 GOTO 120
330 IF XC > 1 THEN XC = XC - 1: GOTO
   430
340 IF XC = 1 THEN XDRAW 2 AT X
   X,YY:XC = 0
350 RR = INT ( RND (1) * 10)
360 IF RR < > 0 THEN 430
370 XX = INT ( RND (1) * 123) +
   76
380 YY = INT ( RND (1) * 151) +
   3
390 XDRAW 2 AT XX,YY:CL = PEEK
   (234): XDRAW 2 AT XX,YY
400 IF CL < > 18 THEN 370
410 DRAW 2 AT XX,YY
420 XC = 50
430 RETURN
440 VTAB 23: HTAB 1: PRINT "CRAS
   H": CHR$( 7): CHR$( 7): CHR$(
   7): CHR$( 7): PRINT "PLAY A
   GAIN? ";
450 VTAB 24: HTAB 13: GET YN$: IF
   YN$ = "Y" THEN RUN
460 IF YN$ = "N" THEN TEXT : HOME
   : END
470 GOTO 450

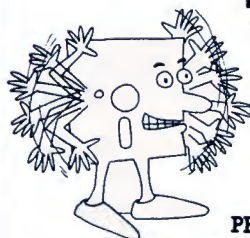
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Program listing. Serpent.



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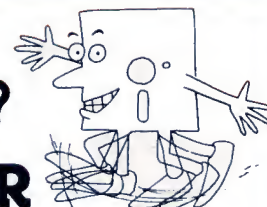
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De-Bug Collection

Getting the bugs out is an important part of the creative process. Don't be afraid to risk mistakes.

by Molly Watt

The Mark II, one of the early computers, simply wasn't working. Something was wrong and everyone involved joined in to investigate the problem. After trying many solutions, someone discovered a large moth stuck in one of the machine's circuits. After they removed the bug, the computer worked.

This true story has become part of the computer culture. Since then, all problems with computers and computer programs that don't work as expected are called "bugs." Hence, the whimsical appellation "debugging" for the process of trapping or isolating the bug in order to correct it. Debugging is one of the most important aspects of programming.

Logo, an instructional computer language developed at M.I.T., teaches debugging skills. Bugs are not simply an irritating nuisance to be avoided. There is probably no such thing as a computer program that works the first time without bugs. Can you imagine a writer who never reworks ideas? The very process of writing implies drafts and revision as essential ingredients. Computer programming is the same.

Drawing a Tree

My first experience using a computer was at the M.I.T. Logo Lab in 1978. The first problem I set myself was to teach the turtle to draw a tree. I struggled to create the large, gnarled oak of my memory. My image was transformed into a triangle on a lolly-

pop stick! Sweating with creative exhaustion, I turned to my husband, expecting praise for a job well done. Instead, he suggested ways to extend and change the project into a more complex tree. Would I like to write a program which made branches on the tree, or one that varied the size of the tree, or one that created a forest? I didn't want to risk moving further into this unknown computer world. Creating the drawing was hard work. Yet I heard my husband say, "But you haven't made any mistakes yet!"

Maybe there was another way to look at mistakes. After a lifetime devoted to avoiding them—and the shame associated with them—perhaps there was something to learn from mistakes when working at a computer.

Procedural Programming

Logo is designed for programming in procedures. Each small procedure accomplishes one task. It does whatever it is written to do, independently from any larger program or superprocedure it is plugged into. Therefore, each bite-sized procedure or program can work on its own. Getting six small programs to work, one right after another, is easier and more efficient than one large program that does the same task. Locating an error in a program longer than several lines is incredibly frustrating and time-consuming. Using the procedural programming style of Logo is an important aid for the inevitable debugging

of the program. Working in an orderly way can also minimize bugs in the first place.

Planning the Program

When Tanya and Bill decided to write a program to draw a boat, they planned the process in a series of steps. First Tanya drew the boat on paper while Bill wrote down a list of the parts of the boat in the order she drew them.

```
TO BOAT
  MAST
  FLAG
  SAIL
  HULL
  TRAVEL (added in anticipation
  WATER of moving the turtle)
END
```

Then they created a procedure tree (Figure 1) to help them visualize their plan. Through it they demonstrated their understanding of the flow of commands and gave them space to add new procedures.

Drawing the Mast

Now it was time to write the program. They worked on each procedure in turn, starting with MAST. Af-

Molly Watt was an elementary school teacher and administrator for more than twenty years. Currently, she is writing Teaching with Logo's Power, to be published by Addison-Wesley in 1984. She teaches Instructional Computing at Keene State College. Write to her at Gregg Lake Road, Antrim, NH 03440.

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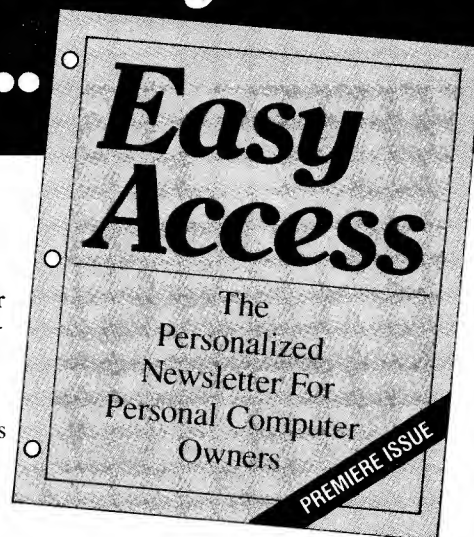
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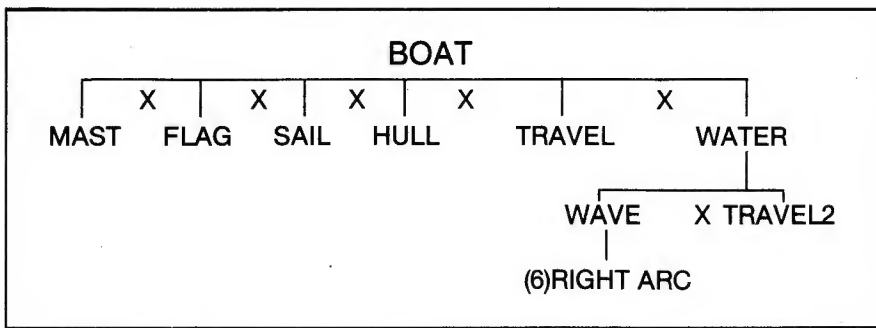


Figure 1.
Procedure tree.

- 1) TRACE allows the user to trace a procedure one line at a time by hitting return when ready for Logo to execute the next line.
- 2) NOTRACE stops TRACE.
- 3) PAUSE, typed into a procedure, stops it at that point and allows the user to type in commands at top level.
- 4) CONTINUE tells the procedure interrupted by PAUSE to continue executing as programmed.

Table. Logo primitives for debugging, specific to the Terrapin and Krell versions of Logo.

ter figuring out how to draw MAST, they defined it (Listing 1), then tried the procedure by typing MAST. Instead of a complete mast being drawn on the screen, execution was interrupted with the message THERE IS NO PROCEDURE NAMED 150.

They were puzzled about this message—FORWARD needs an input and 150 had worked previously. First they checked for the obvious. Yes, they were still in Logo because there was a ? with the cursor blinking beside it. Tanya keyboarded FD 150 just to be sure. She expected the turtle to move forward 150 turtle units. Instead, the same puzzling response appeared. She was mystified. Bill took a turn typing in FD 150; the turtle moved forward 150, just as he had expected it would.

What was different? Tanya tried it again: FD 150. While she typed, Bill watched her hands instead of the screen. He saw Tanya type a letter O instead of a zero. Her typing error made all the difference in the world to the computer. They had located the bug by reading the error message that pinpointed the line in their procedure that didn't work and trying to duplicate the bug. They worked carefully, looking for a logical explanation and an answer to the problem. Once found it was a matter of seconds to enter the Edit mode and replace a zero for the O.

Bug Collection

Tanya and Bill's typing error is one of the most common Logo bugs. After trapping their bug, they entered it in their Bug Collection Journal, including both the error message Logo gave them and what they discovered the message meant. Keeping a bug collection and working on classifying the bugs is a real boon to becoming a programmer!

Wave Procedure

Tanya and Bill resumed work. All went smoothly until they began to work out the procedure for waves. They had trouble predicting where to place the turtle before it started drawing each row of waves. Sometimes the waves crisscrossed through the mast. This problem presented a different category of bug to trap—one of the

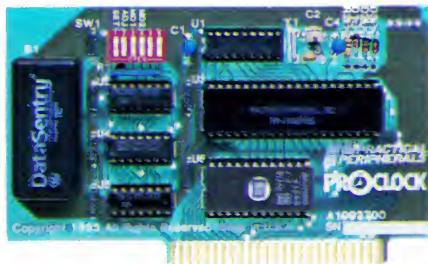
Continued on p. 84.

TO BOAT	TO HULL
MAST	PC 2
FLAG	RT 120
SAIL	REPEAT 6 [FD 10 RT 10]
HULL	FD 100
TRAVEL	REPEAT 6 [FD 10 RT 10]
WATER	FD 10
END	RT 30
	PC 4
	FD 25
TO MAST	END
PC 2	
BK 30	TO TRAVEL
FD 150	PU
END	RT 90
	FD 227
TO FLAG	RT 90
PC 4	FD 40
RT 130	RT 45
FD 20	PD
RT 130	END
FD 20	TO WATER
END	PC 5
	REPEAT 4 [WAVE TRAVEL2]
TO SAIL	END
PC 1	
LT 120	TO WAVE
FD 150	REPEAT 6 [RARC 30 LT 90]
RT 135	END
FD 90	
LT 90	TO TRAVEL2
PU	PU
FD 19	LT 135
RT 90	FD 255
FD 100	RT 90
RT 180	FD 5
PD	RT 45
PC 3	PD
FD 200	END
END	

Program listing. Sailboat.

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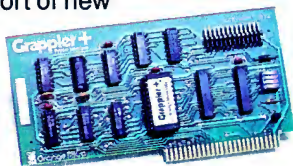
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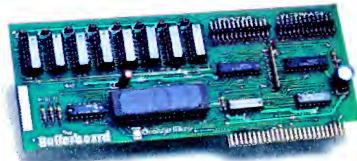
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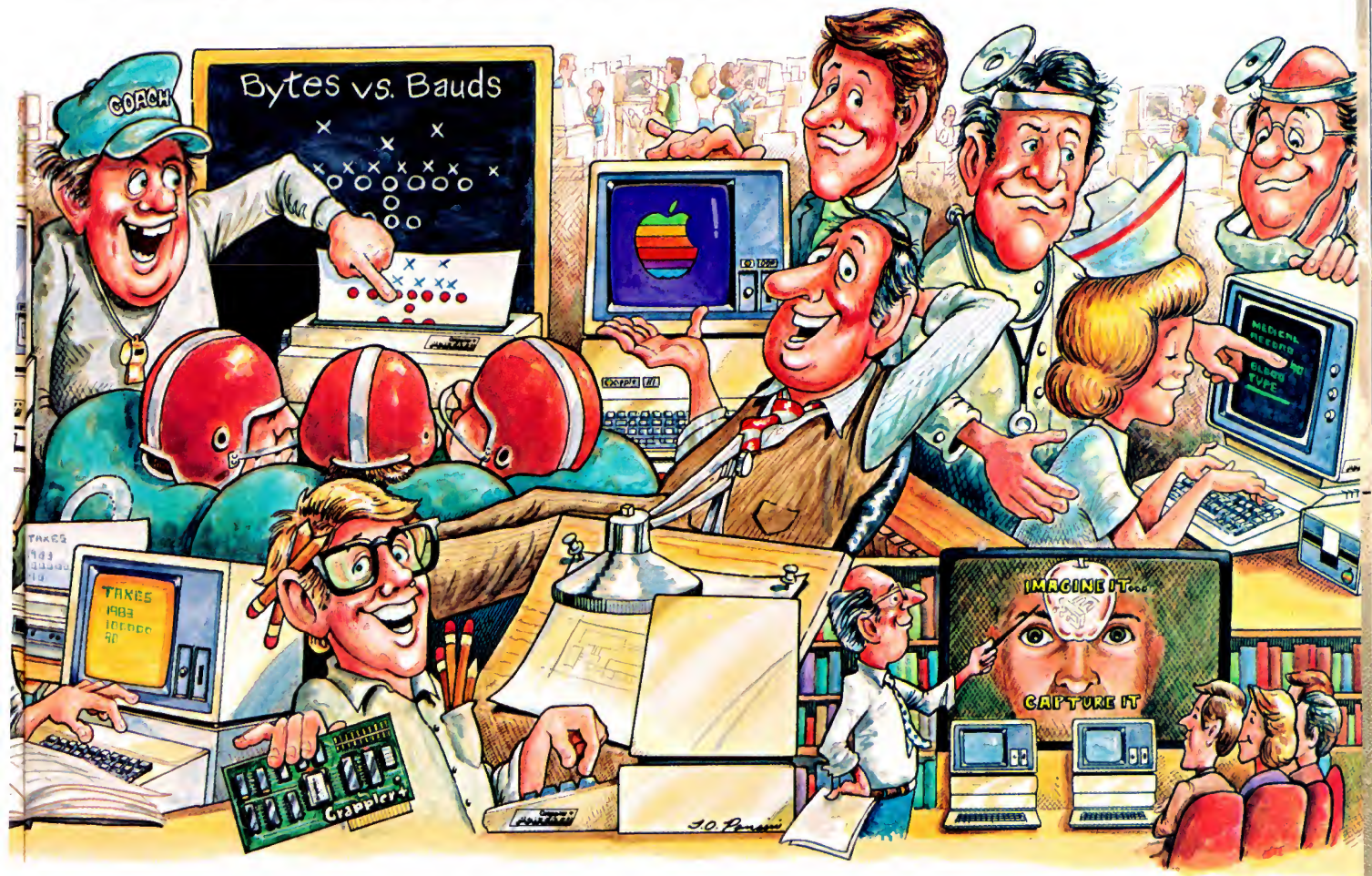
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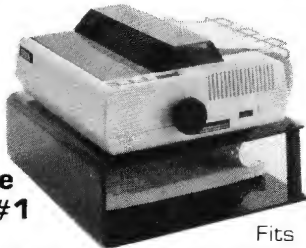
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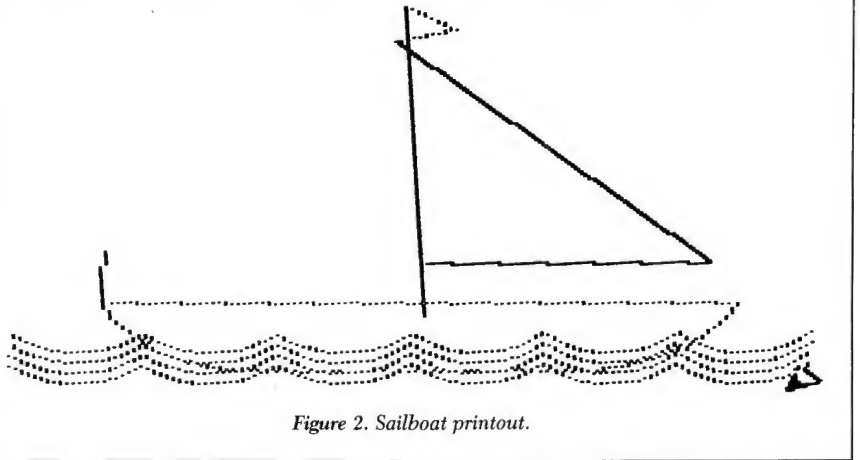


Figure 2. Sailboat printout.

Continued from p. 80.

Turtle State family. In order to solve it, they needed to figure out where the turtle was placed and in which direction it was heading at the end of each line of waves, before telling it to draw the next line.

The Turtle State bug is more subtle than the Typing Error bug. The computer does not give a specific error message to indicate what went wrong. Instead, it demonstrates the error by printing the waves at strange angles across the screen.

Bug Families

Once Tanya and Bill debugged the waves procedure, they entered this bug in their collection. They now had five bug families in their journal.

From previous Logo experiences they had Wrong Mode bugs—usually trapped in the Edit mode when you think you are in Draw mode. They also had the Line Position bug, which happens frequently when you add a stop rule and your procedure doesn't stop. Why? Because it is in the wrong position in the procedure. And there is the repeat/recursion bug. It lives in the last line of a procedure of the same name as the command to be repeated.

There are many other bug families that Tanya and Bill have not yet encountered. In collecting them they will begin to see patterns that will enable them to trap some choice specimens with each encounter.

Error Messages

Terrapin and Krell versions of Logo each have about 28 error messages to help pinpoint bugs. They are written in plain English and experience is needed to interpret their specific meanings, hence the bug collections. The messages are an integral part of the language because debugging is one of the skills taught with this in-

structional computer language. The messages are not there to help adults correct children's programs; they are there for writers of any age and experience to debug their own programs. (Joyce Strong, a teacher at the Oyster River School in Durham, New Hampshire, reports that her first graders, regardless of reading ability, can read their error messages.)

Some examples of the more than two dozen messages are:

YOU DON'T SAY WHAT TO DO WITH ()

() DIDN'T OUTPUT

END SHOULD BE USED ONLY IN THE EDITOR

() IS A LOGO PRIMITIVE

In addition to these phrases, Terrapin/Krell Logo has four commands that are tools specifically designed for program debugging: TRACE, NOTRACE, PAUSE and CONTINUE (Figure 2).

Share Your Bugs

Debugging is a programming skill rather than a nuisance to be avoided. Debugging tools provided within Logo are designed to teach how to correct errors. There is no shame involved in having a bug. Many people feel that examining what doesn't work and figuring out how to correct it is the most important and transferable skill learned at the computer.

Adults must become comfortable with programming bugs and share them with their children or students. This means understanding our own problem-solving strategies and talking about them. It means being with our children when they don't know what's wrong, and supporting them in the process of finding and correcting their errors, in much the same way we support them in learning to tie their own shoes! ■

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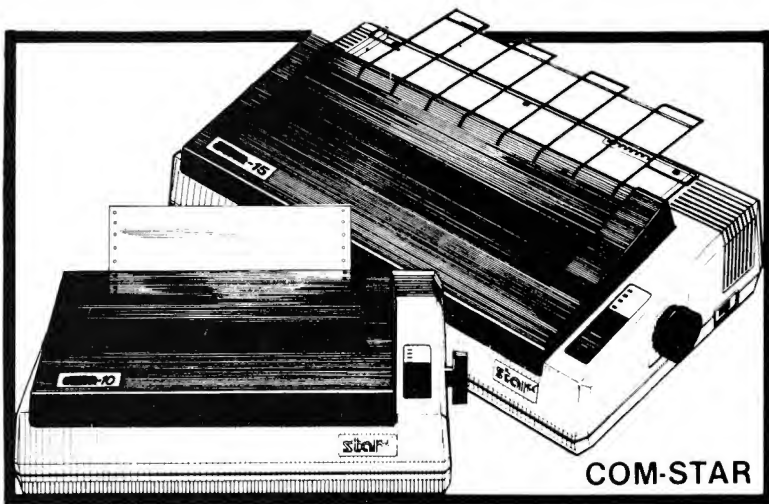


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Load Machine Language and MBasic Together

Here's a quick little trick that enables you to
LOAD an MBasic program and CALL a machine
language subroutine—at the same time.

by Paul M. Danzer

The power of Apple CP/M never ceases to amaze me. Even when the manuals and books don't tell you how, if something is sensible to do, with CP/M you can find a simple way to do it.

The manual that came with my Microsoft Z-80 Softcard mentions an MBasic CALL command for accessing machine language subroutines. Getting the routine into the computer is pretty straightforward, since after you use the ASM and LOAD programs your assembly language subroutine has been transformed into a COM program. Just enter the name of the program (no file type needed), press return and the subroutine is loaded into your machine. The problem begins when you then want to load an MBasic program.

Listing 1 is a PRN listing of a simple program that prints a dollar sign on the monitor. The third line is the usual ORG statement to place the pro-

gram at the beginning of the transient program area (TPA), located at hex 100.

This ORG 100H is necessary for the assembler, ASM, to work, but as a side effect, any other COM program, such as MBASIC.COM, will overwrite your nice little subroutine. After going to the trouble of loading your subroutine into the machine, as soon as you enter MBasic and press return the subroutine is wiped out.

In order to run any program in MBasic, you must first load MBASIC.COM. Therefore, it would appear that the CALL function is worthless—you can't load the subroutine and MBasic simultaneously.

CP/M to the Rescue

Even though your subroutine must have that nasty little ORG statement in it, nothing says it has to refer to 100H. Listing 2 shows the same assembly language program as a sub-

routine (ending with a RET or return). Notice the fourth line of code. There is a second ORG statement, but this one is at 9000H. MBASIC.COM takes up 25,000 bytes at the bottom of the TPA, so assuming a relatively small MBasic program, your subroutine up at 9000H is well out of harm's way.

If you were to run ASMPROG as a COM program, it would do absolutely nothing; the first statement, at 100H, jumps back to 0000H, the address of WBOOT (warmboot). This is the equivalent of returning you to the CP/M command level. But notice the rest of the subroutine is still happily tucked away at 9000H awaiting your call.

The MBasic program in Listing 3 applies this trick. Line 10 prints TEST from the MBasic program. Line 30 calls the assembly language subroutine and displays a dollar sign on the screen. The PRINT statement in line 40 supplies a carriage return and line feed. Finally, line 50 prints IT WORKS from an MBasic statement, proving that you are back at the MBasic command level.

To get this whole thing to work, first type ASMPROG to load the COM file version of the program in Table 2. As noted before, nothing happens

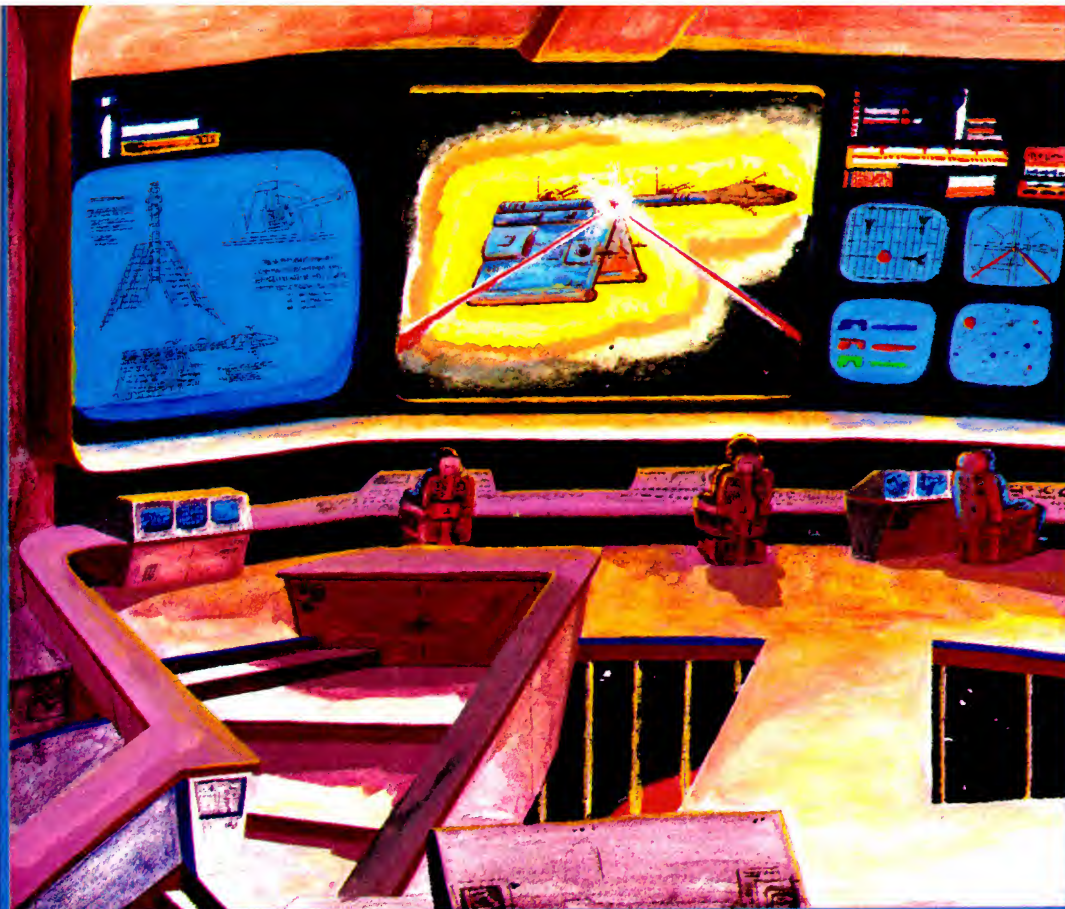
```

0005 =      BDOS  EQU      5
0002 =      WCONF EQU      2
0100          ORG     100H      ;PUTS PROGRAM AT
                                ; START OF TPA
0100 0E02      MVI     C,WCONF ;PLACES DOLLAR
0102 1E24      MVI     E,'$'   ; SIGN ON
0104 CD0500    CALL    BDOS    ; SCREEN
0107 C30000    JMP     0       ;GO TO WARM BOOT
010A          END              ;END ASSEMBLY

```

Listing 1. TEST.PRN.

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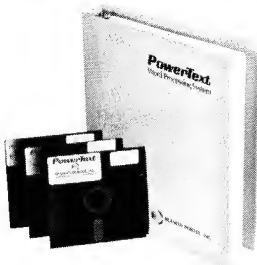
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```

0000 =          WBOOT      EQU      0
0100                      ORG      100H      ;NEEDED FOR ASM
0100 C30000          JMP      WBOOT      ;RET TO CP/M
9000                      ORG      9000H      ;SUBROUTINE
                                ; STARTS HERE
9000 =          NEXT      EQU      $      ;EQUATES MAKE
0002 =          WCONF     EQU      2      ; SUBROUTINE
0005 =          BDOS      EQU      5      ; SELFSTANDING
9000 0E02          MVI     C,WCONF      ;PLACES DOLLAR
9002 1E24          MVI     E,'$'      ; SIGN ON
9004 CD0500        CALL    BDOS      ; SCREEN
9007 C9            RET              ;RETURN FROM
                                ; CALL
9008                      END              ;END ASSEMBLY

```

Listing 2. ASMPROG.PRN.

```

10      PRINT "TEST"      :REM PUTS "TEST" ON SCREEN
20      ABC = &H9000      :REM ABC IS SUBROUTINE ADDRESS
30      CALL ABC          :REM CALLS SUBROUTINE
40      PRINT             :REM CARRAGE RET/ LINE FEED
50      PRINT "IT WORKS"  :REM BACK TO MBASIC LEVEL
60      END

```

Listing 3. BASPROG.BAS

and you should get the usual CP/M prompt. Next load in the MBasic COM file by typing MBASIC, and finally type RUN "BASPROG.BAS". Assuming there are no problems, you should see the following on your monitor:

```

TEST
$
IT WORKS

```

Now that you know it works, wouldn't it be good to avoid doing all of this manually? Once again, CP/M to the rescue.

Turn a new disk into a system disk by using COPY with the /S option. This command formats the new disk and copies the CP/M system onto it, so it can be booted in drive A by itself. Now, using PIP, copy the following onto this disk as well:

- ASMPROG.COM—first assemble and load the assembly language routine in Table 2.

- MBASIC.COM—from your CP/M master disk.

- BASPROG.BAS—from Table 3.

- SUBMIT.COM—from your CP/M master disk.

Next, using PIP, ED or a word processor, open a file called TOGETHER.SUB. This is a SUBMIT file, and consists of exactly two lines:

```

ASMPROG
MBASIC BASPROG.BAS

```

Now your new disk has the original four programs on it, in addition to TOGETHER.SUB.

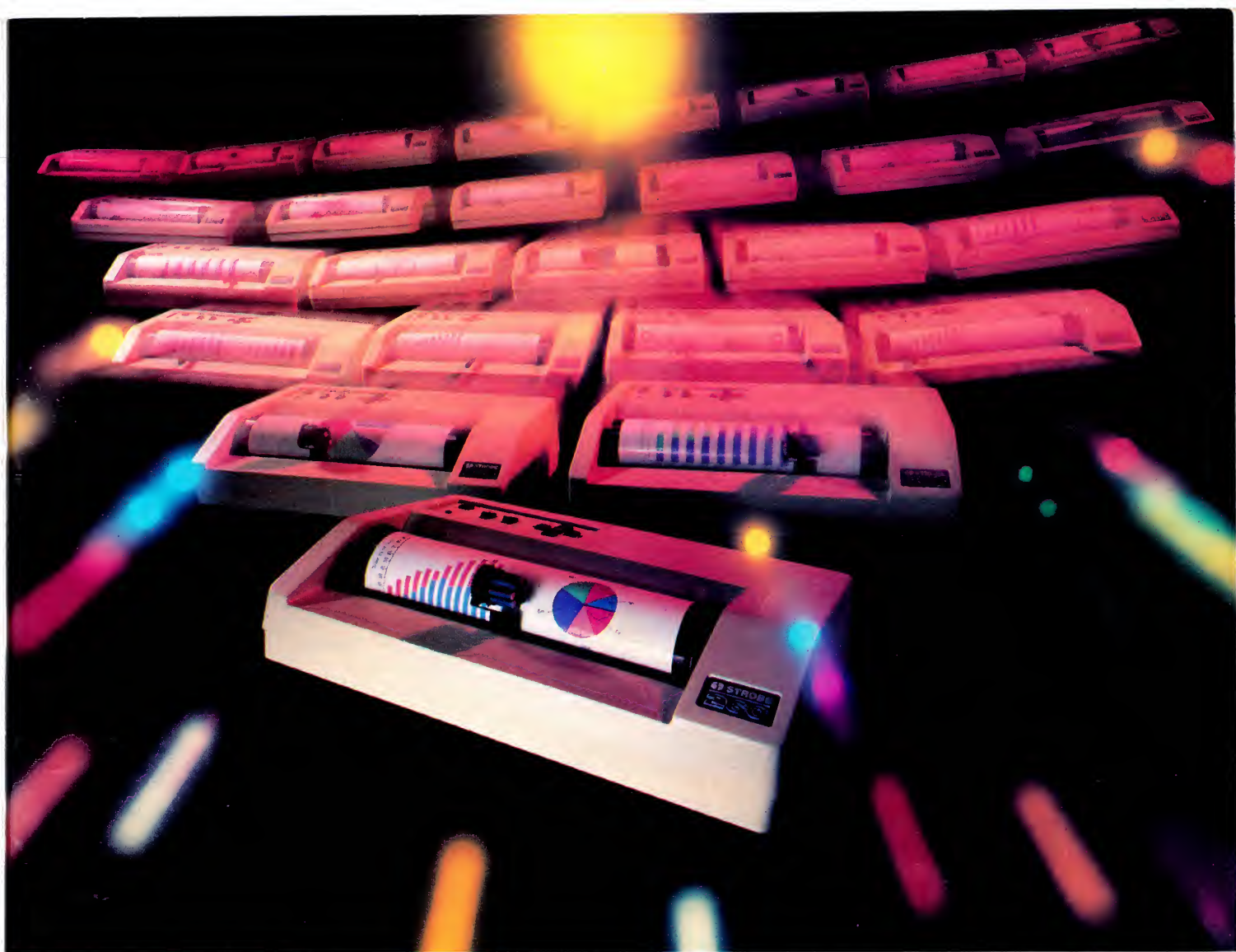
To see the program work, insert

this disk into drive A (it will only work in drive A) and hit control-C for a warm boot. Type SUBMIT TOGETHER and watch the monitor. First you will see the CP/M prompt as the ASMPROG.COM file loads and returns the system to the CP/M command level. Next, with a whirring of the disk, the usual MBasic header of version, copyright and date appears. Finally, the magic TEST, \$, and IT WORKS appear on three separate lines.

There are just two little quirks you should know about. The first, mentioned before, is that it will only work in drive A. Second, since SUBMIT opens a temporary file on the disk, you cannot write protect the disk with a tab over the notch. If you want to write protect the programs, boot your system master disk in drive A, place your new disk in drive B, and type STAT B: *.*\$R/O.

For those who like to be absolutely precise, both a load of pokes (from MBasic) or the CP/M debugger, DDT, could be used to locate a subroutine almost anywhere—but our object is to do it simply, easily, and with a minimum of typing. Now you can place machine language subroutines into your computer at the same time as MBasic programs, so I guess that CALL function under MBasic is useful after all.

What did you say? You want to mix and match subroutines and MBasic programs from the keyboard? Well if you use XSUB... ■



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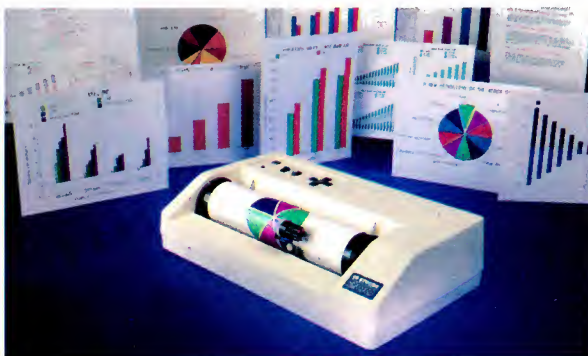
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by Gregory R. Glau

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A.....	Array for the first year's data
A\$.....	Used for GET command
B.....	Array for the second year's data
C.....	Counter for plotting the hash marks up and down the left and right sides of graph
D.....	Used as a divisor to get the entry numbers down to 100 or lower
N.....	Counter for stepping across the screen
Q.....	Input variable for amounts
X.....	Counter, subset for arrays A and B

Table 1. Variables used in the program.

If any entry is the amount in Column A or larger, the program will scale in the increments shown in Column B.

A	B
100,001.....	100,000's
10,001.....	10,000's
1,001.....	1,000's
101.....	100's
11.....	10's

If all numbers are 10 or lower, the program will scale in increments of 1.

If any number is larger than 1,000,000, it will not be accepted. If the largest number is 1,000,000, the program will scale in increments of 100,000.

Table 2. Scaling parameters of the program.

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```

10 GOSUB 5000
15 REM ^^ INSTRUCTIONS
20 DIM A(12): DIM B(12)
30 REM A IS THE 1ST YEAR'S DATA
40 REM B IS THE 2ND YEAR'S DATA
800 HOME : PRINT
805 REM THIS IS
810 REM FOR THE FIRST YEAR'S DATA
820 FOR X = 1 TO 12
830 HOME : VTAB 5
832 PRINT "...ANSWER -1 TO ENTER DATA FOR YEAR 2..."
835 PRINT "THIS IS THE DATA FOR YEAR ";
836 INVERSE : PRINT "ONE": NORMAL
837 PRINT
840 PRINT "PLEASE ENTER THE DATA FOR MONTH"
850 PRINT "NUMBER ";X;: PRINT ":"
860 INPUT A(X)
865 IF A(X) = - 1 THEN 900
867 IF A(X) > 1000000 THEN 840
868 IF A(X) < - 1 THEN 840
870 NEXT X
900 REM THIS IS
910 REM FOR THE SECOND YEAR'S DATA
920 FOR X = 1 TO 12
930 HOME : VTAB 5
935 PRINT "...ANSWER -1 TO TO EXIT...": PRINT
940 PRINT "THIS IS THE DATA FOR YEAR ";
945 INVERSE : PRINT "TWO": NORMAL
950 PRINT
960 PRINT "PLEASE ENTER THE DATA FOR MONTH"
970 PRINT "NUMBER ";X;: PRINT ":"
980 INPUT B(X)
985 IF B(X) = - 1 THEN 1000
987 IF B(X) > 1000000 THEN 960
988 IF B(X) < - 1 THEN 960
990 NEXT X
1000 REM THIS SCALES OUT THE DATA
1002 HOME : PRINT "...WORKING..."
1005 REM LINES 1012 AND 1013 WILL
1006 REM GET RID OF THE -1'S FIRST
1010 REM IF ANY NUMBER IS LARGER THAN 100000 THEN D=10000
1011 FOR X = 1 TO 12
1012 IF A(X) = - 1 THEN A(X) = 0
1013 IF B(X) = - 1 THEN B(X) = 0
1014 IF A(X) > 100000 THEN 1650
1016 IF B(X) > 100000 THEN 1650
1018 NEXT X
1020 REM IF ANY NUMBER IS LARGER THAN 10000 THEN D=1000
1030 FOR X = 1 TO 12
1035 IF A(X) > 10000 THEN 1700
1037 IF B(X) > 10000 THEN 1700
1040 NEXT X
1050 REM IF ANY NUMBER IS LARGER THAN 1000 THEN D=100
1060 FOR X = 1 TO 12
1070 IF A(X) > 1000 THEN 1720
1080 IF B(X) > 1000 THEN 1720
1085 NEXT X
1090 REM IF ANY NUMBER IS LARGER THAN 100 THEN D=10
1100 FOR X = 1 TO 12
1110 IF A(X) > 100 THEN 1740
1120 IF B(X) > 100 THEN 1740
1125 NEXT X
1128 FOR X = 1 TO 12
1130 IF A(X) > 10 THEN 1750
1140 IF B(X) > 10 THEN 1750
1150 NEXT X
1160 REM ALL THE NUMBERS ARE LESS
1170 REM THAN 10
1180 D = .1
1182 S$ = "SCALED BY 1'S"
1190 GOTO 2000
1650 D = 10000
1652 S$ = "SCALED BY 100,000'S"
1660 GOTO 2000
1700 D = 1000
1702 S$ = "SCALED BY 10,000'S"

```

Listing continued.

total labor costs (in thousands) look like related to hours worked (in hundreds)—or compare your total income (in thousands) to your restaurant budget (in tens).

In that kind of comparison, you'd want to see the two plot lines on the same screen, but you'd obviously chart them on two widely different scales. A bar graph probably would not be the best way to view that data, because the scales would vary so much.

So for these purposes, you should use the same scale for both bars. Also, since you want to keep things simple and not run out of room on your Apple screen, you should work with 24 figures—two years' worth of information.

The basic graph should start with January and run through December. You can enter zero for any month where you do not have any data. To help you plot both bars on the same scale, the program includes an automatic scaling feature that scales on the largest number you enter.

If you enter 23 of 24 numbers (12 for each year) under 1,000 and the odd one is 1,245, the program will scale to 1,245 and divide your graph in increments of 1,000. Your 1,245 will show up, but all smaller numbers will not.

This means all of your numbers should be in the same general range, so you get the best possible "picture" of the relationships among the data.

If the program finds that any of your numbers are larger than 100,000, it scales in increments of 100,000. If they're all smaller than 100,000, it looks through them again and checks if any number is larger than 10,000. If so, it scales in increments of 10,000.

This same procedure continues as the program checks to see if any number is larger than 1,000 (if so, it scales in thousands), or 100, or 10. The largest number it will accept is 1,000,000 (it will scale in 100,000 increments then). Table 2 shows exactly where the graph scales.

Since you can change any or all of your numbers, you immediately can see what effect a change in value for

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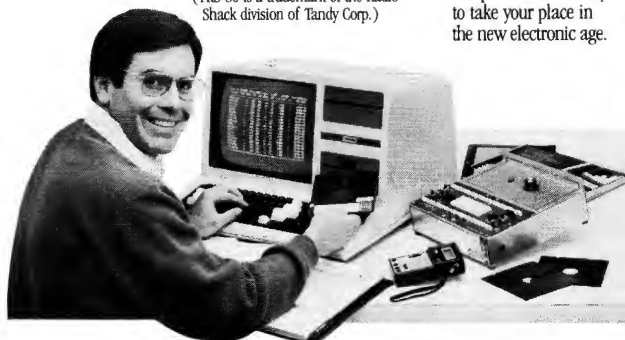
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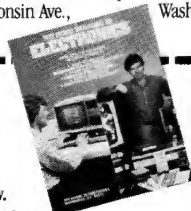
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Listing continued.

```

1710 GOTO 2000
1720 D = 100
1722 S$ = "SCALED BY 1,000'S"
1730 GOTO 2000
1740 D = 10
1742 S$ = "SCALED BY 100'S"
1745 GOTO 2000
1750 D = 1
1752 S$ = "SCALED BY 10'S"
1760 GOTO 2000
2000 REM NOW WE HAVE TO DIVIDE TO GET THE SCALE RIGHT
2010 REM ALL NUMBERS COME HERE LESS THAN 100
2030 REM NOW WE HAVE TO REDUCE ALL NUMBERS
2040 REM TO LESS THAN 40% OF THEIR CURRENT
2050 REM TO FIT THE APPLE SCREEN
2060 FOR X = 1 TO 12
2070 A(X) = A(X) / D
2080 B(X) = B(X) / D
2090 NEXT X
2100 FOR X = 1 TO 12
2110 A(X) = A(X) * .39
2120 B(X) = B(X) * .39
2130 NEXT X
3000 REM THIS DRAWS THE GRAPH
3005 X = 1
3010 GR
3020 COLOR= 6
3030 FOR N = 2 TO 36 STEP 3
3040 VLIN 40 - A(X),40 AT N
3050 X = X + 1
3060 NEXT N
3070 REM DRAW 2ND YEAR'S DATA
3080 COLOR= 10
3085 X = 1
3090 FOR N = 3 TO 37 STEP 3
3100 VLIN 40 - B(X),40 AT N
3110 X = X + 1
3120 NEXT N
3200 FOR C = 0 TO 40 STEP 4
3210 PLOT 0,C
3220 PLOT 30,C
3230 NEXT C
3400 PRINT " J F M A M J J A S O N D"
3450 PRINT "1ST YEAR DATA IS ON THE LEFT SIDE."
3500 PRINT "THIS GRAPH IS ";S$;"."
3510 PRINT "HIT ANY KEY TO CONTINUE...";: GET A$
3530 TEXT
3535 HOME
3536 PRINT : PRINT "...WORKING..."
3540 FOR X = 1 TO 12
3550 A(X) = A(X) / .39
3560 A(X) = A(X) * D
3670 B(X) = B(X) / .39
3680 B(X) = B(X) * D
3685 NEXT X
3690 REM ^^ TO GET BACK TO THE APPROXIMATE STARTING FIGURES
3700 GOTO 4000
4000 REM :CORRECTION AREA
4010 HOME : PRINT
4020 PRINT "HERE IS THE FIRST YEAR'S DATA:"
4030 PRINT
4040 PRINT "MONTH","AMOUNT"
4050 FOR X = 1 TO 12
4060 PRINT X,A(X)
4070 NEXT X
4080 PRINT
4090 PRINT "ANSWER THE ITEM NUMBER TO"
4100 PRINT "CHANGE IT, 0 TO CONTINUE, OR"
4105 PRINT "-1 TO STOP THE PROGRAM NOW:"
4110 INPUT Q
4115 IF Q = - 1 THEN PRINT "END OF PROGRAM": END
4120 IF Q < - 1 THEN 4000
4130 IF Q > 12 THEN 4000
4140 IF Q = 0 THEN 4200
4150 PRINT
4160 PRINT "ENTER THE CORRECT AMOUNT FOR ITEM"
4170 PRINT Q;" ";: INPUT A(Q)
4175 IF A(Q) > 1000000 THEN GOSUB 4500
4177 IF A(Q) < 0 THEN A(Q) = 0
4180 GOTO 4000
4200 HOME : PRINT
4210 PRINT "HERE IS THE SECOND YEAR'S DATA:"

```

Listing continued.

any entry (or entries) makes on your graph. Unfortunately, you cannot save the information, or load data from disk and then graph it. The program is designed to let you enter numbers from the keyboard, and let you change them if you wish.

The Program

Enough about theory and program design; let's run through the system.

The first line, 10, sends you to line 5000 where you have two pages of instructions. You're then returned to line 20, which dimensions the two single-dimension arrays the program uses—A for the first year's data, and B for the second year's.

You must enter the information for the first year. If you only have six months' worth of information, don't keep entering zeroes for the blank data—enter - 1 to exit the first year entry section and move to the second year's part.

If you enter any other negative number, the program will ask again for the same month's data. It isn't designed to graph down from zero, so it will not accept a negative entry.

The program section from 800-870 also checks if your entries are larger than 1,000,000; if so, it asks again. Lines 900-990 perform the same functions for the second year's information. This time though, - 1 will move you to the scaling part of the program.

Once you've completed data entry for year two (by answering all 12 entry points, or - 1 to tell the program you have no more data), go to line 1000.

Lines 1000-1190 clear the screen, display ...WORKING... so you'll know something is happening, and begin the scaling process. Here the program reads through your numbers and based on the largest one, determines the proper scale. You're then sent to lines 1650-1760 where the variable D is assigned a value based on the largest number you entered.

Because of the Apple screen's limits and the fact that for speed we use lo-res graphics, we have only 40 plotting

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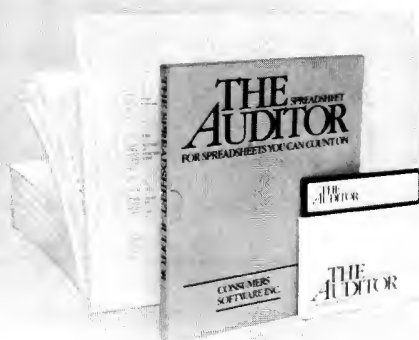
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Listing continued.

```

4220 PRINT
4230 PRINT "MONTH","AMOUNT"
4240 FOR X = 1 TO 12
4250 PRINT X,B(X)
4260 NEXT X
4270 PRINT
4280 PRINT "ANSWER THE ITEM NUMBER TO"
4290 PRINT "CHANGE IT, 0 TO CONTINUE, OR"
4295 PRINT "-1 TO STOP THE PROGRAM NOW:"
4300 INPUT Q
4305 IF Q = - 1 THEN PRINT "END OF PROGRAM": END
4310 IF Q < - 1 THEN 4200
4320 IF Q > 12 THEN 4200
4325 IF Q = 0 THEN 4400
4330 PRINT
4340 PRINT "ENTER THE CORRECT AMOUNT FOR ITEM"
4350 PRINT Q;" ";: INPUT B(Q)
4355 IF B(Q) > 1000000 THEN GOSUB 4600
4357 IF B(Q) < 0 THEN B(Q) = 0
4360 GOTO 4200
4400 REM ALL DATA IS CORRECT
4405 HOME : PRINT : PRINT "...WORKING..."
4410 GOTO 1000
4500 HOME : VTAB 5
4510 PRINT "SORRY, THE LARGEST FIGURE CAN'T"
4520 PRINT "BE ANY BIGGER THAN 1,000,000"
4530 PRINT
4532 PRINT "THIS WILL AUTOMATICALLY ZERO OUT"
4534 PRINT "THE INCORRECT ENTRY (";Q;")": PRINT
4540 PRINT "HIT ANY KEY TO CONTINUE..."
4550 A(Q) = 0
4560 GET A$
4570 RETURN
4600 HOME : VTAB 5
4610 PRINT "SORRY, THE LARGEST FIGURE CAN'T"
4620 PRINT "BE ANY BIGGER THAN 1,000,000"
4630 PRINT
4635 PRINT "THIS WILL AUTOMATICALLY ZERO OUT"
4637 PRINT "THE INCORRECT ENTRY (";Q;")": PRINT
4640 PRINT "HIT ANY KEY TO CONTINUE..."
4650 B(Q) = 0
4660 GET A$
4670 RETURN
5000 HOME : PRINT
5010 PRINT "THIS PROGRAM WILL CREATE BAR"
5020 PRINT "GRAPHS FOR TWO SETS OF DATA, WITH"
5030 PRINT "UP TO 12 ENTRIES IN EACH SET."
5040 PRINT
5050 PRINT "IT'S DESIGNED TO DISPLAY OVER A"
5060 PRINT "ONE YEAR PERIOD, STARTING IN JANUARY"
5070 PRINT "AND RUNNING THROUGH DECEMBER."
5080 PRINT
5090 PRINT "HOWEVER, YOU CAN ENTER ZERO FOR THOSE"
5100 PRINT "MONTHS IN WHICH YOU DO NOT HAVE ANY"
5110 PRINT "INFORMATION."
5120 PRINT
5130 PRINT "YOU CAN MOVE FROM THE FIRST YEAR'S"
5140 PRINT "DATA TO THE SECOND YEAR'S BY ANSWERING"
5150 PRINT "-1, AS THE DISPLAY WILL TELL YOU."
5160 PRINT
5170 PRINT "HIT ANY KEY TO CONTINUE..."
5180 GET A$
5200 HOME : PRINT
5210 PRINT "YOU'LL ALSO HAVE THE CHANCE TO CORRECT"
5220 PRINT "YOUR FIGURES AFTER YOU SEE THE FIRST"
5230 PRINT "GRAPH, IF YOU WISH."
5240 PRINT
5250 PRINT "REMEMBER THAT THE SYSTEM WILL SCALE"
5260 PRINT "TO YOUR LARGEST FIGURE. SO, IF YOU "
5270 PRINT "HAVE MOST OF YOUR NUMBERS LESS THAN"
5280 PRINT "1,000, BUT HAVE ONE OR MORE OVER"
5290 PRINT "THAT 1,000 FIGURE, THE GRAPH WILL"
5300 PRINT "SCALE TO THE LARGER AMOUNT."
5310 PRINT
5312 PRINT "THE GRAPH SCALES IN INCREMENTS ON"
5314 PRINT "1, 10, 100, 1000, AND 10,000."
5316 PRINT
5320 PRINT "THE LARGEST NUMBER THE SYSTEM WILL"
5330 PRINT "ACCEPT IS 1,000,000. IT WILL NOT"
5340 PRINT "ACCEPT A NEGATIVE FIGURE FOR AN ENTRY."
5400 PRINT : PRINT "HIT ANY KEY TO CONTINUE..."
5410 GET A$
5600 RETURN

```

points available. This would be simple if all the numbers you might enter were less than 40. But to accommodate information for graphing we must divide the entries by a suitable number to a size that will fit on the screen.

To do this, the Apple divides a number into all of your entries to get them all down to 100 or lower, but still makes sure they maintain their relative value. Thus, an entry of 15000 would be divided by 1000 and end up as 15. An entry of 13000 also would be divided by 1000, and so would end up as 13. The numbers are much smaller, but their *relationship* is preserved by the variable D.

Remember that D was set according to the largest number you entered. Lines 2000-2090 divide your numbers by D. This converts them all to 100 or lower. It keeps things neat.

But we only have 40 spaces up-and-down on which to plot our information. This means we must *decrease* all of our numbers to less than 40 percent of their current value. Since they all are less than 100, lines 2100-2130 multiply all the numbers by .39, to decrease their size so they'll fit properly on your Apple screen.

Creating the Graph

Now you're ready to create your graph display; lines 3000-3510 do just that. Line 3005 sets X to one, as it will be used as a counter. Line 3010 puts you into the lo-res graphics mode with the GR command.

Line 3030 sets up a loop that controls the plotting points as you move across the graph. It starts at 2 and moves across in steps of 3. When you plot the second year's data (starting at line 3070), a similar loop will start at 3 and move across, still stepping at intervals of 3. This compiles January's data. The plot for the first year will be adjacent to that of the second year's numbers. Then there will be a blank space, and then February's figures start across the screen.

The basic plotting lines (3040 and 3100) draw a vertical line (VLIN) from 40 (the top of your screen) minus the value for the month, to 40, the bottom line of your graph.

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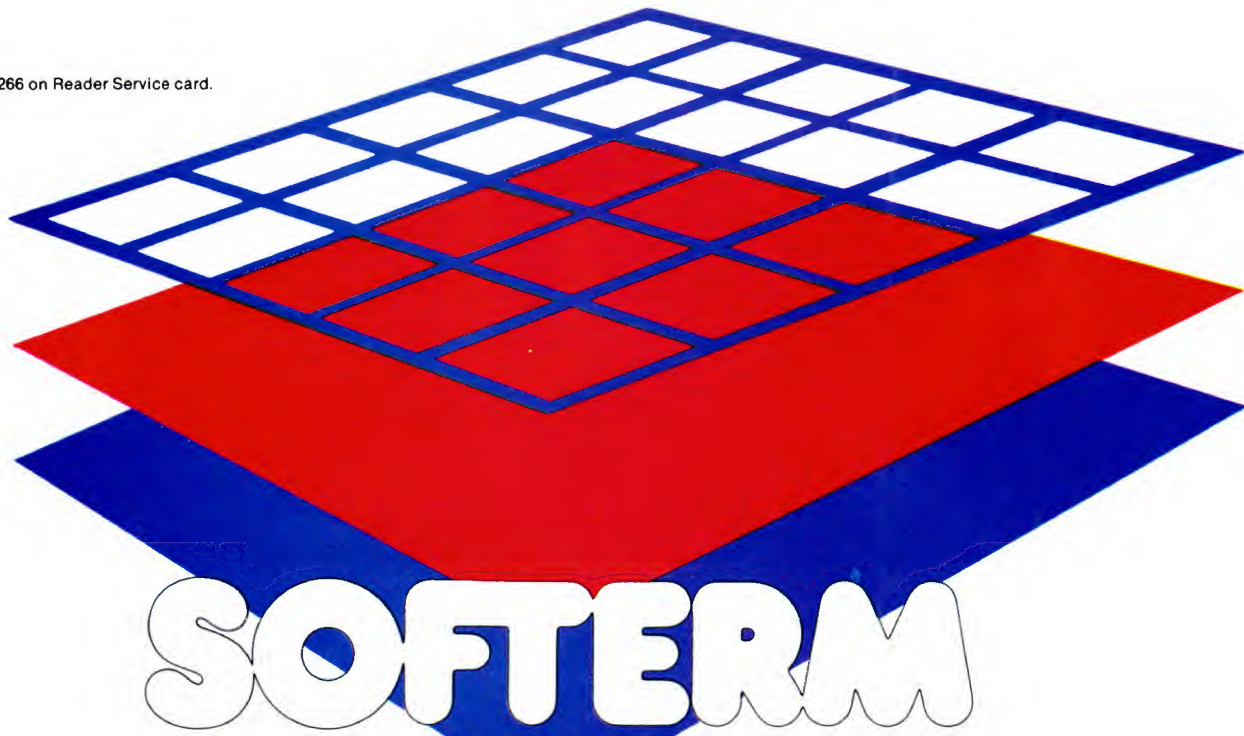
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So if your first number is 15, the plotting lines would draw a vertical line from 25 (which is 40 minus 15) down to 40 (the bottom of the graph area). If your second number was 23, the program would draw a line from 17 (which is 40 minus 23) down to 40.

This method keeps the integrity of your numbers correct; the larger the number, the higher up on the screen that particular line goes.

This method—deducting your figure from the highest point available—keeps the graph right side up. Otherwise, all the numbers would extend down nicely from the top of your screen.

Lines 3030 and 3090 tell the program where on the screen to plot each line, going left to right; there are 40 points *across* the screen, too. Line 3030 starts its plot at space #2 for January of the first year. Line 3090 starts its plot at space #3, placing the data

from January of the second year next to the data from the first year. Both lines step by three. This gives you the two plots for each month followed by a blank space.

As the program goes through this sequence, it draws your graph. It also shows the scale, and puts hash marks up both sides.

These only *approximate* the exact figures because each graph created in lo-res uses a number of pixels (screen dots for each "plot" on the graph) and so is not perfectly true to scale. But keep in mind the graph's purpose is not to see exact amounts, but rather to get a picture of your information.

Lines 3510–3700 convert the display back to text and converts your numbers back to their original size.

Remember that if you started with a number of 1500 and the graph was scaled in thousands, it would be converted immediately to 15. Then, to

fit on your screen, that 15 was multiplied by .39, and so the number that is actually plotted is $(1500/100) \times .39$, or 5.85. A starting entry of 1980 would be plotted as $(1980/100) \times .39$, 7.72.

The relationship between 1500 and 1980 is exactly the same as it is between 5.85 and 7.72. However, you really don't have to be concerned with all this math—the program will do it automatically for you.

When this process is reversed, your numbers are reconverted in lines 3510–3700 to display your original figures, so you can correct or change them. This is vital. You wouldn't want to enter that 1980 value as, for instance, the kilowatt hours of electricity your business used in a month, and then view it for correction purposes as 7.72!

Once you make corrections or changes, the numbers again are

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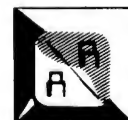
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checked to reset the scale if needed, divided by the variable D to get them all down to 100 or lower, and multiplied by .39 so they'll fit on your screen.

Lines 4000-4410 let you change any of your numbers. They connect to two subroutines, 4500 and 4600, which inform you if any entry is larger than 1,000,000, and then ask again. These subroutines will zero-out any entry you make larger than that one-million figure; the plotting routine won't graph that large a number.

This correction area lets you adjust your data and then see what effect these changes have on your bar graph.

Unless you tell the program to stop (with -1), you're in a continuous loop. You see the graph of your data, then you can change any or all of it, and then you're back to the graph

again.

That's the whole story. It seems more complex on paper than it is. The program is self-prompting and lets you exit on every level.

By the way, if you read through the instructions a time or two and don't want to take the time to type them into the program, it won't hurt anything. Just be sure you eliminate line 10, as well as all lines from 5000 on.

Bar Room

Twenty-four items of information—two year's worth—is all that fits on the screen with lo-res plotting. Hi-res gives you more room for information, but is much slower to create bar graphs. There's no spot for a "title," since all information is entered just before you view the graph. You'll know what you're working on.

Since the program won't SAVE or

LOAD data from a text file, why not interface one? You can LOAD your data directly into arrays A and B and let the program plot.

What do you think of moving the zero line so the program can plot negative numbers, too? You could.

Why not change the program to plot your data cumulatively? Then if you were plotting, for example, your electricity or gas usage (or dollars spent), you could see the total amount as the year goes along. It would give you an entirely different picture, but with the same information and scaling and plotting routines.

Try this simple graphics program for your home or business. And once you have it in and running on your Apple, experiment with it a bit. You'll not only learn more about Basic and graphics, but also about where your dollars go. ■

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Fudge It!

by Don Fudge

Getting Shapely

This month I'll be looking at the creation of basic geometrical shapes with plotting, and the act of making vector shapes travel in paths that describe these shapes.

Since you're not likely to read my column again if I teach square, triangle and rectangle drawing, I won't dwell long on these geometrical wonders. I feel that the interesting shapes are circular, elliptical and spirographical, and that the most interesting curves are sine and cosine. These are the gems we'll be learning to draw, and the paths we'll be learning to travel.

Some of the letters I get are from young people wanting a close look at graphics *without* the complexity of block shapes, fill routines, interrupts, collision counters or sprites.

Even though a larger portion of my mail is from graphics programming amateurs seeking information on shapes, sprites and animation, it doesn't hurt to cater to the seekers of the simpler side of graphics.

Getting Geometric

Let's get squares and such out of the way first. A square has four equal sides, four right (90°) angles; its area is determined by the length of a side squared. A rectangle is similar. Two sets of parallel sides are equal, but adjacent sides are unequal, and the area is base times height. A *cube* is more fun, having an area of $6S^2$ and a volume of S^3 , where S is the length of a side. A rectangular prism is kind of neat, with a width (W), height (H) and depth (D). Its area (surface) is $2HW + 2HD + 2DW$, while its volume is $D \times W \times H$.

A triangle is much sturdier, ar-

chitecturally, than a 4-or-more-sided figure, so architects often try to get triangular strength into their construction. A triangle has three angles adding up to 180° . An equilateral triangle has three equal sides and three equal angles. An isosceles triangle has two equal sides and two equal angles. If one angle is 90° , the triangle is a *right* triangle. Angles over 90° are *obtuse*; angles under 90° are *acute*. *Trigonometry* is a study of the relationships of the various sides and angles in right triangles. It's invaluable in measuring distances and in construction. A triangle's area is one half of the base times the height.

One type of triangular solid is a triangular prism, but a *cone* is more fun. It has a volume of $\pi R^2 H / 3$, where $\pi = \text{PI} = 3.1416$, R = radius and H = height.

A circle is a nice shape. Its circumference is $2\pi R$ where R = radius. The area is πR^2 . An *ellipse* is egg-shaped, and has an area of π times horizontal radius times vertical radius.

A *sphere* is one kind of three-dimensional circle. It has an area of $4\pi R^2$ and a volume of $4/3 \times \pi R^3$. A

cylinder is another kind of three-dimensional circle. Its area is $2\pi RH + 2\pi R^2$ and its volume is $\pi R^2 H$, where H = height.

Getting Curvaceous

A sine curve is a graph of the sine values of a range of numbers. A cosine curve is the same, but concerns cosine values. The *sine* of an angle is a function representing the length of the opposite side divided by the length of the hypotenuse. The *cosine* of an angle is a function representing the length of the adjacent side divided by the length of the hypotenuse. A *hypotenuse* is the side opposite the right angle. The *opposite side* is the side of the triangle opposite the angle in question. The *adjacent side* is the one that's neither the opposite side nor the hypotenuse. Sine curves and cosine curves have aesthetic shapes to them—a refreshing breeze through the arid fields of science, electronics and math.

A *spiral* is a never-ending arc that keeps getting closer and closer to a straight line; in other words, its radius keeps increasing.

In the following programs, I'll deal

```
9 H = 140:K = 95:R = 70
10 HIMEM: 36095
20 D$ = CHR$(4)
30 PRINT D$"BLOODCHAR"
35 POKE 232,0: POKE 233,141
36 PRINT "CHOOSE ANY SINGLE LETTER OR NUMBER:": INPUT "(A - Z OR 0 - 9):"
  A$
37 IF ASC(A$) > 48 AND ASC(A$) < 58 THEN A = ASC(A$) - 8: GOTO 41
38 IF ASC(A$) = 48 THEN A = 50: GOTO 41
39 IF ASC(A$) > 64 AND ASC(A$) < 91 THEN A = ASC(A$) - 64: GOTO 41
40 GOTO 36
41 HGR: POKE -16382,0: HCOLOR= 3: ROT= 64: SCALE= 1
42 FOR X = H - R TO H + R STEP 5
43 Y = K - INT ( SQR ((R * R) - (X - H) * (X - H)))
44 HCOLOR= 0: DRAW A AT 0X,0Y: HCOLOR= 3: DRAW A AT X,Y: 0X = X: 0Y = Y: NEXT
50 FOR X = H + R TO H - R STEP -5
60 Y = K + INT ( SQR ((R * R) - (X - H) * (X - H)))
70 HCOLOR= 0: DRAW A AT 0X,0Y: HCOLOR= 3: DRAW A AT X,Y: 0X = X: 0Y = Y: NEXT
```

Listing 1. Circling Letters.

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with many of the shapes above, especially ellipses, circles, sine curves, cosine curves, spirals and spirographical shapes.

Loco Listings

Listing 1 is Circling Letters. To vary the circle's size, vary R in line 9. To vary the center, vary H and K, the horizontal and vertical center coordinates.

Listing 2 is Circle or Ellipse Drawing. You'll notice that as the circles' points are plotted, they become sketchy and infrequent in some places. I solved this problem by plotting half-circles from four different formulae (that's why there are four FOR-NEXT loops).

"Sine and cosine curves manage to create some great figures."

Ellipsing Letters is Listing 3. It allows letters to move in an elliptical orbit. To vary the radii of the ellipse, change A or B in line 19. Don't make radii so big that you get "illegal quantity" errors.

Spiralling Dot is Listing 4. As you can see in 40, 90, 140 and 190, the radius keeps on increasing as the circle formula does its stuff. A quicker, looser spiral would require $R = R + 2$ or more, while $R = R + .5$ would give a tighter one.

Spirographing Formulae is Listing 5. If you've never played with a *spirograph*, I suggest you get one and experiment with it—they're a trip. In Listing 5, Polar Coordinates, functions defined by the DEF and FN instructions, and sine and cosine curves manage to create some great figures. You can input step and scale values, and can have an axis if you wish.

Listing 6 is Spirographing Letters. In this little gem, letters (vector shapes) are made to describe a spiro-

```

1  PRINT "TO DO A CIRCLE, SIMPLY MAKE YOUR      HORIZONTAL & VERTICAL RA
   DII EQUAL.": PRINT
2  INPUT "CENTER,X COORD.:";J
3  INPUT "CENTER,Y COORD.:";K
4  INPUT "HORIZONTAL RADIUS:";A
5  INPUT "VERTICAL RADIUS:";B
6  PRINT "ONCE FIGURE IS DRAWN, HIT ANY KEY TO  CONTINUE---": FOR OH = 1
   TO 3500: NEXT : IF FL = 1 THEN POKE - 16304,0: POKE - 16297,0: GOTO
   20
7  HGR : POKE - 16302,0: HCOLOR= 3
8  FOR Y = K - B TO K + B
9  X = J + INT ( SQRT ((A * A) * (1 - (((Y - K) * (Y - K)) / (B * B))))))
10 HPLLOT X,Y: NEXT
11 FOR X = J - A TO J + A
12 Y = K - INT ( SQRT ((B * B) * (1 - (((X - J) * (X - J)) / (A * A))))))
13 HPLLOT X,Y: NEXT
14 FOR X = J - A TO J + A
15 Y = K + INT ( SQRT ((B * B) * (1 - (((X - J) * (X - J)) / (A * A))))))
16 HPLLOT X,Y: NEXT
17 FOR Y = K - B TO K + B
18 X = J - INT ( SQRT ((A * A) * (1 - (((Y - K) * (Y - K)) / (B * B))))))
19 HPLLOT X,Y: NEXT
20 PP = PEEK (- 16384): IF PP > 127 THEN POKE - 16368,0: GOTO 110
21 GOTO 100
22 POKE - 16303,0: POKE - 16298,0: INPUT "DO YOU WANT TO DO ANOTHER?(Y
   /N):";RR$: IF RR$ = "Y" THEN 120
23 END
24 PRINT : INPUT "DO YOU WANT TO PUT IT ON TOP OF THE LAST ONE OR HAVE SC
   REEN CLEARED?(T FOR ON TOP & C FOR CLEAR):";AN$:
25 IF AN$ = "T" THEN FL = 1
26 GOTO 2

```

Listing 2. Circle or Ellipse Drawing.

```

10 HIMEM: 36005
11 J = 140:K = 95:A = 100:B = 50
12 D$ = CHR$(4)
13 PRINT D$"BLOADCHAR"
14 POKE 232,0: POKE 233,141
15 PRINT "CHOOSE ANY SINGLE LETTER OR NUMBER:": INPUT "(A - Z OR 0 - 9):"
   ;A$
16 IF ASC (A$) > 48 AND ASC (A$) < 58 THEN A = ASC (A$) - 8: GOTO 41
17 IF ASC (A$) = 48 THEN A = 50: GOTO 41
18 IF ASC (A$) > 64 AND ASC (A$) < 91 THEN A = ASC (A$) - 64: GOTO 41
19 GOTO 36
20 HGR : POKE - 16302,0: HCOLOR= 3: ROT= 64: SCALE= 1
21 FOR X = J - A TO J + A STEP 5
22 Y = K - INT ( SQRT ((B * B) * (1 - (((X - J) * (X - J)) / (A * A))))))
23 HCOLOR= 0: DRAW A AT 0X,0Y: HCOLOR= 3: DRAW A AT X,Y:0X = X:0Y = Y: NEXT
24
25 FOR X = J + A TO J - A STEP - 5
26 Y = K + INT ( SQRT ((B * B) * (1 - (((X - J) * (X - J)) / (A * A))))))
27 HCOLOR= 0: DRAW A AT 0X,0Y: HCOLOR= 3: DRAW A AT X,Y:0X = X:0Y = Y: NEXT

```

Listing 3. Ellipsing Letters.

Listing 4. Spiralling Dot.

```

1  ONERR GOTO 63995
2  H = 140:K = 95:R = 5
3  D$ = CHR$(4)
4  PRINT D$"BLOADDOT"
5  POKE 232,80: POKE 233,20
6  HGR : POKE - 16302,0: HCOLOR= 3
7  ROT= 64: SCALE= 1
8  FOR Y = K - R / 1.5 TO K + R / 1.5 STEP 10
9  X = H + INT ( SQRT ((R * R) - (Y - K) * (Y - K)))
10 XDRAW 1 AT 0X,0Y
11 0X = X:0Y = Y
12 R = R + 1
13 NEXT
14 FOR X = H + R / 1.5 TO H - R / 1.5 STEP - 10
15 Y = K + INT ( SQRT ((R * R) - (X - H) * (X - H)))
16 XDRAW 1 AT 0X,0Y
17 0X = X:0Y = Y
18 R = R + 1
19 NEXT

```

Listing continued.

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Fudge It!

Listing continued.

```

120 FOR Y = K + R / 1.5 TO K - R / 1.5 STEP - 10
130 X = H - INT ( SQR ((R * R) - (Y - K) * (Y - K)))
131 XDRAW 1 AT 0X,0Y
134 0X = X:0Y = Y
140 R = R + 1
150 NEXT
170 FOR X = H - R / 1.5 TO H + R / 1.5 STEP 10
180 Y = K - INT ( SQR ((R * R) - (X - H) * (X - H)))
181 XDRAW 1 AT 0X,0Y
184 0X = X:0Y = Y
190 R = R + 1
200 NEXT
300 GOTO 20
63995 PP = PEEK (222): POKE 216,0: END
  
```

```

3 INPUT "CHOOSE TYPE 1-10: "; TT
4 ON TT GOTO 10,11,12,13,14,15,16,17,18,19
10 DEF FN NUC(NB) = COS (4 * NB): GOTO 20
11 DEF FN NUC(NB) = SIN (4 * NB): GOTO 20
12 DEF FN NUC(NB) = COS (2 * SIN (NB)): GOTO 20
13 DEF FN NUC(NB) = COS (2 * SIN (2 * NB)): GOTO 20
14 DEF FN NUC(NB) = COS ( SIN (100 * NB)): GOTO 20
15 DEF FN NUC(NB) = COS ( SIN (8 * NB)): GOTO 20
16 DEF FN NUC(NB) = COS (4 * SIN (2 * NB)): GOTO 20
17 DEF FN NUC(NB) = SIN (6 * COS (4 * NB)): GOTO 20
18 DEF FN NUC(NB) = SIN (8 * SIN (4 * NB)): GOTO 20
19 DEF FN NUC(NB) = COS (8 * SIN (16 * NB)): GOTO 20
20 HOME : VTAB 1
30 INPUT "STEP?(.1 TO 3,USUALLY): "; ST
35 INPUT "SCALE?(20-80,USUALLY): "; SC
50 HOME
60 INPUT "AXIS?(Y/N): "; RR$
70 IF RR$ = "Y" THEN FLAG = 1
80 HGR : POKE - 16302,0
90 IF FLAG = 0 THEN 130
95 HCOLOR= 1
105 HPLT 0,95 TO 279,95
125 HPLT 141,0 TO 141,191
130 HCOLOR= 3
135 FOR NN = 0 TO 360 STEP ST
145 CN = NN / 57.3
155 Y = FN NUC(CN) * SIN (CN)
170 X = FN NUC(CN) * COS (CN)
175 Y = INT (Y * SC): X = INT (X * SC)
185 IF NN = 0 THEN HPLT 140 + X,95 - Y
195 HPLT TO 140 + X,96 - Y
300 NEXT
  
```

Listing 5. Spirographing Formulae.

graphical path. To change the path, vary the formula in line 45.

Sine Color is a sine graph with a lot of color. Vary colors in lines 3, 41, 43 and 46. Or, change the depth of the curves by varying the five in lines 20 and 34. That's Listing 7.

Boomerang.functions is an experimental program I wrote to test various sine and cosine curves for my "Boomerang!" game in my StarSprite II sprite graphics system. Here it is in all its splendor (Listing 8). One can make aesthetic curves with this algo-

rithm. To get a list of your sine and cosine values, dump lines 10 and 60 and insert lines 35 and 93 that PRINT N, X, Y.

Incidentally, you must use POKE 104,64 and POKE 16384,0 in your Hello program that boots before you run any of these programs. You'll also have to keep doing CATALOG to see what to RUN next. You cannot run DT or CHAR. DT is simply a vector shape dot, a table seven bytes long. Do CALL - 151 before entering it:

\$1450:01 00 04 00 07 00 00

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The Visible Computer: 6502.

```

10 HIMEM: 36095
19 S = 50
20 D$ = CHR$(4)
30 PRINT D$"BLOADCHAR"
35 POKE 232,0: POKE 233,141
36 PRINT "CHOOSE ANY SINGLE LETTER OR NUMBER:": INPUT "(A - Z OR 0 - 9):"
  A$
37 IF ASC (A$) > 48 AND ASC (A$) < 58 THEN A = ASC (A$) - 8: GOTO 41
38 IF ASC (A$) = 48 THEN A = 50: GOTO 41
39 IF ASC (A$) > 64 AND ASC (A$) < 91 THEN A = ASC (A$) - 64: GOTO 41
40 GOTO 36
41 HGR : POKE - 16302,0: HCOLOR= 3: ROT= 64: SCALE= 1
45 DEF FN NK(U) = COS (4 * SIN (2 * U))
140 FOR O = 0 TO 360 STEP 5
150 U = O / 57.3
160 Y = FN NK(U) * SIN (U)
170 X = FN NK(U) * COS (U)
180 Y = INT (Y * S):X = INT (X * S)
190 SCALE= 1: ROT= 64: HCOLOR= 0: DRAW A AT 140 + OX,95 - OY: HCOLOR= 3: DRAW
  A AT 140 + X,95 - Y:OX = X:OY = Y: NEXT

```

Listing 6. Spirographing Letters.

```

2 HGR : POKE - 16302,0
3 HCOLOR= 5
10 A = 1
20 Y = INT (5 * COS (A)) + INT (5 * SIN (A))
33 HPLLOT 10 * A,10 * Y + 100
34 Y = INT (5 * COS (A)) + INT (5 * SIN (A))
35 A = A + .133
37 IF 10 * A > = 278 THEN GOTO 70
38 HPLLOT TO 10 * A,10 * Y + 100
41 HCOLOR= 6
42 HPLLOT 10 * A,10 * Y + 100 TO 10 * A,0
43 HCOLOR= 2
44 HPLLOT 10 * A,10 * Y + 100 TO 10 * A,185
46 HCOLOR= 5
60 GOTO 20
70 END

```

Listing 7. Sine Color.

```

10 HGR : HCOLOR= 3: POKE - 16302,0
15 Y = 0
20 FOR A = 1.5 TO 5 STEP .05
25 N = COS (A)
28 X = (208 - 5) * N + 208
30 Y = Y + 1.5
40 HPLLOT X,Y: NEXT
50 GET A$
60 HGR : HCOLOR= 3: POKE - 16302,0
65 Y = 0
70 FOR A = 0 TO 3.3 STEP .05
80 N = SIN (A)
90 X = 145 * N + 96
92 Y = Y + 1.5
95 HPLLOT X,Y: NEXT

```

Listing 8. Boomerang functions.

then hit Return and BSAVE DT, A5200, L7.

The long listing, Char, is Listing 9. It's a complete set of vector shape numbers and letters (and some symbols) that is scalable and rotatable. It takes a while to enter, but it's worth it. (You also could modify the preceding programs and use your own vec-

tor shapes.) In case it looks familiar, yes—I have used it before in this column. I find it the handiest vector shape table I've ever had. Perhaps you will too. You may DRAW, XDRAW, SCALE and ROTate with it.

If you use your own shape tables, you must change the enclosed program listings so that they BLOAD your file name, rather than BLOAD CHAR and DT.

By the way, the starting address of DT is \$1450 and the length is seven. The starting address of Char is \$8D00 and the length is \$8D0. Char requires a HIMEM of 36096 to work correctly. The reason: strings will store over the shape table if you don't specify this HIMEM (36096=\$8D00). The strings in a program will always store downwards from HIMEM, and default HIMEM is 38400, which is only a few bytes beyond the end of the Char file's RAM address after it's

BLOADED.

POKE 104,64 and POKE 16384,0 in your Hello program insure that all programs will LOAD at \$4000, out of the way of hi-res page 1, which is where the graphics in these programs will be performed. If we wanted to use HGR2 instead of HGR in the programs—which would mean we'd be using hi-res page 2—we'd need POKE 104,96 and POKE 24576,0 in Hello.

See you next time! ■

Listing 9. Char.

```

*8000.95D7
8000- 34 00 6E 00 A5 00 E5 00
8008- 13 01 46 01 77 01 9C 01
8010- CF 01 F8 01 21 02 43 02
8018- 74 02 91 02 C1 02 F2 02
8020- 25 03 55 03 8D 03 C6 03
8028- 00 04 1F 04 49 04 71 04
8030- A1 04 D2 04 F5 04 26 05
8038- 2D 05 35 05 48 05 76 05
8040- 87 05 A5 05 C4 05 E1 05
8048- F7 05 06 06 14 06 5D 06
8050- 79 06 94 06 BB 06 F2 06
8058- 2B 07 50 07 68 07 C4 07
8060- E8 07 2B 08 6A 08 B6 08
8068- 88 08 FF FF FF FF 24 24
8070- 24 24 24 24 25 25 2D 2D
8078- 2D 2D 2D 2E 2E 36 36 3F
8080- 36 36 36 3F 24 24 3F 3F
8088- 3F 3F 3F 3F 36 36 3F 3F
8090- 08 40 41 C0 18 20 24 25
8098- 2D 2D 2D 2D 2E 2E 36 3F
80A0- 3F 3F 3F 07 00 24 24 24
80A8- 24 24 24 24 2D 2D 2D 2D
80B0- 2D 2D 2E 2E 36 3E 3E 36
80B8- 35 35 36 37 37 3F 3F 3F
80C0- 3F 3F 3F 41 28 2D 2D 2D
80C8- 2D 2C 3C 3C 3C 3F 3F 3F
80D0- 37 36 46 40 C0 28 2D 2D
80D8- 2D 2C 2C 3C 3C 3F 3F 3F
80E0- 3F 36 36 05 00 09 2D 2D
80E8- 2D 2D 2D 2C 2C 24 3F 3E
80F0- 3E 3F 3F 3F 27 27 24 24
80F8- 24 2C 2C 2D 2D 2D 35 35
8E00- 2D 24 27 27 3F 3F 3F 3F
8E08- 3F 3E 3E 36 36 36 36 36
8E10- 35 35 00 2D 2D 2D 2D 2D
8E18- 2D 2C 2C 24 24 24 24 24
8E20- 27 27 3F 3F 3F 3F 3F 3F
8E28- 36 36 36 36 36 36 36 40
8E30- 01 2D 2D 2D 2D 25 25 24
8E38- 24 24 3C 3C 3F 3F 3F 3F
8E40- 36 36 36 36 36 00 2D 2D
8E48- 2D 2D 2D 2D 2D 24 3F 3F
8E50- 3F 3F 3F 3F 24 24 2D 2D
8E58- 2D 2D 24 3F 3F 3F 3F 24
8E60- 24 2D 2D 2D 2D 2D 24 24
8E68- 3F 3F 3F 3F 3F 3F 3F 36
8E70- 36 36 36 36 36 00 2D 2D
8E78- 24 24 24 2D 2D 2D 2D 24
8E80- 3F 3F 3F 3F 24 24 2D 2D

```

Listing continued.

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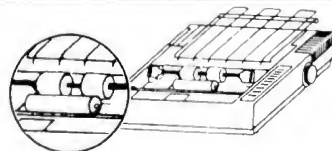
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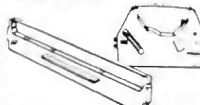
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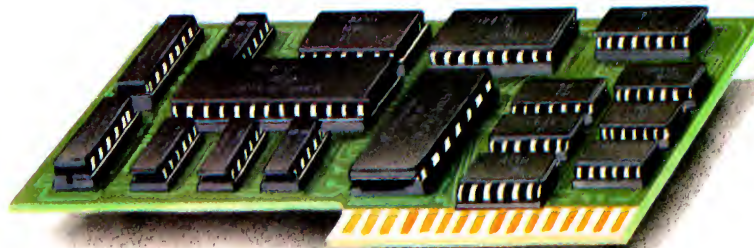
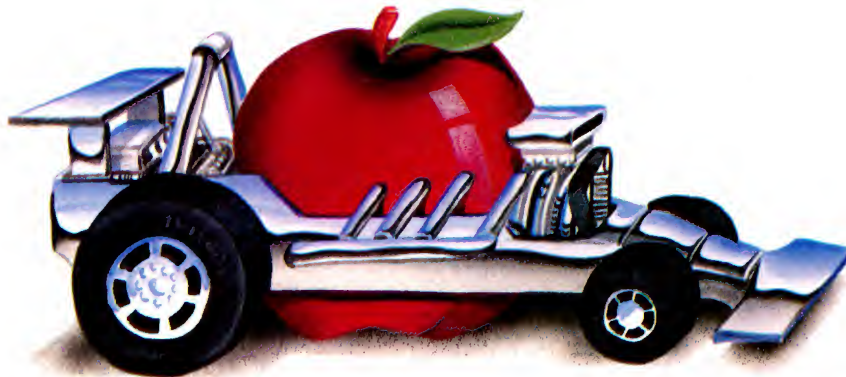
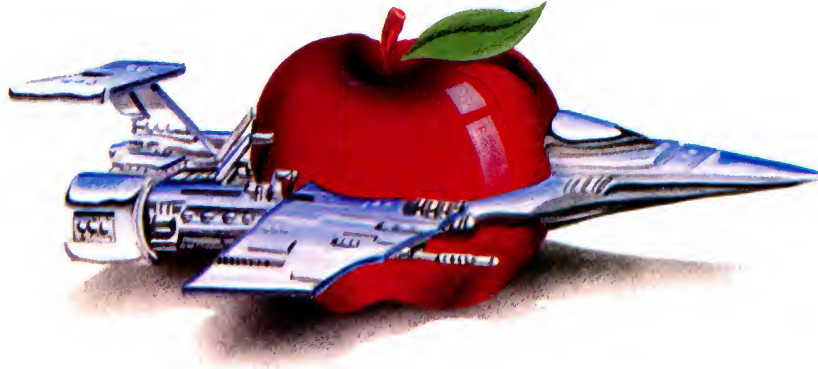
Listing continued.

8E88- 2D 2D 2D 2D 24 3F 3F 3F
8E90- 3F 3F 3F 3F 36 36 36 36
8E98- 36 36 36 00 09 2D 2D 2D
8EA0- 2D 2D 2C 2C 24 24 3F 3F
8EA8- 37 2E 2D 3E 3E 3F 3F 3F
8EB0- 27 27 24 24 24 2C 2C 2D
8EB8- 2D 2D 35 35 2D 2E 27 27
8EC0- 3F 3F 3F 3F 3F 3E 3E 36
8EC8- 36 36 36 36 35 35 00 2D
8ED0- 24 24 24 2D 2D 2D 2D 2D
8ED8- 36 36 36 2D 24 24 24 24
8EE0- 24 24 24 3F 36 36 36 3F
8EE8- 3F 3F 3F 3F 24 24 24 3F
8EF0- 36 36 36 36 36 36 36 00
8EF8- 2D 2D 2D 2D 2D 2D 2D 24
8F00- 3F 3F 3F 24 24 24 24 24
8F08- 2D 2D 2D 24 3F 3F 3F 3F
8F10- 3F 3F 3F 36 2D 2D 2D 36
8F18- 36 36 36 36 3F 3F 3F 36
8F20- 00 09 2D 2D 2D 2D 2D 2C
8F28- 2C 24 24 24 24 24 24 3F
8F30- 36 36 36 36 36 3E 3E 3F
8F38- 3F 3F 27 27 24 3F 36 36
8F40- 35 35 00 2D 24 24 2C 2E
8F48- 35 2D 2E 35 2D 2E 2D 24
8F50- 3F 3C 27 3F 3C 27 3F 24
8F58- 2D 2C 25 2D 2C 25 2D 24
8F60- 3F 37 3F 3E 37 3F 3E 37
8F68- 27 24 24 3F 36 36 36 36
8F70- 36 36 36 00 2D 2D 2D 2D
8F78- 2D 2D 2D 24 3F 3F 3F 3F
8F80- 3F 3F 24 24 24 24 24 24
8F88- 3F 36 36 36 36 36 36 36
8F90- 00 2D 24 24 24 24 24 35
8F98- 35 35 35 2D 2C 2C 2C 2C
8FA0- 36 36 36 36 36 2D 24 24
8FA8- 24 24 24 24 24 3F 3E 3E
8FB0- 3E 3E 3E 27 27 27 27 27
8FB8- 3F 36 36 36 36 36 36 36
8FC0- 00 2D 24 24 24 24 24 35
8FC8- 35 35 35 35 35 35 35 35
8FD0- 35 2D 24 24 24 24 24 24
8FD8- 24 3F 36 36 36 36 36 27
8FE0- 27 27 27 27 27 27 27 27
8FE8- 27 3F 36 36 36 36 36 36
8FF0- 36 00 09 2D 2D 2D 2D 2D
8FF8- 2C 2C 24 24 24 24 24 27
9000- 27 3F 3F 3F 3F 3F 3E 3E
9008- 36 36 36 36 36 35 35 40
9010- 2D 2D 2D 2D 2C 24 24 24
9018- 24 27 3F 3F 3F 3F 3E 36
9020- 36 36 36 35 00 2D 24 24
9028- 24 2C 2D 2D 2D 2D 25 25
9030- 25 24 27 27 3F 3F 3F 3F
9038- 3F 3F 36 36 36 36 36 36
9040- 36 08 48 48 00 00 28 2D
9048- 2D 2D 2D 2C 3C 3F 3F
9050- 3F 3F 36 06 00 09 2D 2D
9058- 2D 2D 2C 2E 2D 3C 2C 24
9060- 24 24 24 24 27 27 3F 3F
9068- 3F 3F 3F 3E 3E 36 36 36
9070- 36 36 35 35 40 2D 2D 2D
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9080- 24 27 3F 3F 3F 3F 3E 36
9088- 36 36 36 35 00 2D 24 24
9090- 24 2C 2D 2D 2D 35 36 36
9098- 36 2D 24 24 24 24 25 25
90A0- 24 07 3C 3C 3F 3F 3F 3F
90A8- 3F 37 36 36 36 36 36 36
90B0- 0E 40 41 00 00 18 08 2D
90B8- 2D 2D 2D 05 2C 3C 3C 3F
90C0- 3F 3F 3F 36 06 00 09 2D
90C8- 2D 2D 2D 2D 2C 2C 24 24
90D0- 27 27 3F 3F 3F 3F 27 27
90D8- 2C 2C 2D 2D 2D 35 35 2D
90E0- 24 27 27 3F 3F 3F 3F
90E8- 3E 3E 36 36 35 35 2D 2D
90F0- 2D 2D 35 35 3E 3E 3F 3F

90F8- 3F 27 27 3F 36 35 35 00
9100- 49 49 2D 24 24 24 24 24
9108- 24 2D 2D 2D 24 3F 3F 3F
9110- 3F 3F 3F 3F 36 2D 2D 2D
9118- 36 36 36 36 36 00 09 09
9120- 2D 2D 2D 2D 2D 2C 2C 24
9128- 24 24 24 24 24 3F 36 36
9130- 36 36 36 3E 3E 3F 3F 3F
9138- 27 27 24 24 24 24 24 3F
9140- 36 36 36 36 36 35 35 35
9148- 00 49 49 2D 24 25 2C 24
9150- 25 2C 24 25 2C 24 3F 3E
9158- 36 37 3E 36 37 3E 27 3C
9160- 24 27 3C 24 27 3F 36 35
9168- 2E 36 35 2E 36 35 2E 36
9170- 00 2D 2C 2C 2C 2C 2C 35
9178- 35 35 35 35 2D 24 24 24
9180- 24 24 24 24 3F 36 36 36
9188- 36 36 27 27 27 3F 3E 3E
9190- 3E 3E 3E 24 24 24 24 24
9198- 3F 36 36 36 36 36 36 36
91A0- 00 2D 2C 2C 2C 2C 2C 35
91A8- 35 35 35 35 2D 24 27 27
91B0- 27 27 27 2C 2C 2C 2C 2C
91B8- 24 3F 3E 3E 3E 3E 27 27
91C0- 27 27 27 27 3F 36 35 35
91C8- 35 35 35 3E 3E 3E 3E 3E
91D0- 36 00 49 49 2D 24 24 24
91D8- 24 25 25 25 25 25 3F 3F
91E0- 37 37 37 37 3F 3C 3C 3C
91E8- 3C 3F 2E 2E 2E 2E 2E 2E
91F0- 36 36 36 36 00 24 25 25
91F8- 25 25 25 25 25 25 25 25
9200- 3F 3F 3F 3F 3F 24 2D 2D
9208- 2D 2D 2D 2D 2D 36 37 37
9210- 37 37 37 37 37 37 37 37
9218- 2D 2D 2D 2D 2D 36 3F 3F
9220- 3F 3F 3F 3F 3F 00 49 49
9228- 2D 24 3F 36 00 49 49 2E
9230- 2C 24 3F 36 00 49 49 2D
9238- 24 3F F6 40 18 08 2D 24
9240- 24 24 24 24 3F 36 36 36
9248- 36 36 00 49 49 2D 24 3F
9250- F6 40 18 08 2D 24 2C 2D
9258- 25 25 25 24 3C 3C 3F 3F
9260- 3F 3F 3F 3E 3E 3E 2E 25
9268- 2C 2C 2D 2D 2D 35 35 37
9270- 3F 3F 37 36 36 00 40 00
9278- 40 01 2D 2D 2D 2D 2D 24
9280- 3F 3F 3F 3F 3F 36 00 40
9288- 40 2D 2D 2D 2D 2D 24 3F
9290- 3F 3F 3F 3F F6 40 18 08
9298- 2D 2D 2D 2D 2D 24 3F 3F
92A0- 3F 3F 3F 36 00 49 49 2D
92A8- 24 24 24 2D 2D 2D 24 3F
92B0- 3F 3F 24 24 24 3F 36 36
92B8- 36 3F 3F 3F 36 2D 2D 2D
92C0- 36 36 36 00 2D 2C 2C 2C
92C8- 2C 2C 2C 2C 2C 2C 2C 2C
92D0- 2C 24 3F 3E 3E 3E 3E 3E
92D8- 3E 3E 3E 3E 3E 3E 3E 36
92E0- 00 40 40 40 40 18 08 2D
92E8- 24 24 3F 36 36 40 09 28
92F0- 25 24 3C 37 36 06 00 49
92F8- 49 2E 2C 24 3F F6 40 00
9300- 00 2D 24 3F 36 00 49 49
9308- 2D 24 3F F6 40 00 40 2D
9310- 24 3F 36 00 49 29 25 2D
9318- 2E 25 2D 2C 2C 24 3C 3C
9320- 3C 27 24 35 35 2D 24 27
9328- 27 3F 3C 37 3F 3C 37 3F
9330- 3E 3E 36 2E 2E 2E 35 36
9338- 27 27 3F 36 35 35 2D 46
9340- 40 2D 24 3C 37 76 40 00
9348- 25 25 27 37 F6 00 40 18
9350- 24 3C 37 36 2D 00 03 24
9358- 3C 3E 2E 2E 00 49 49 29
9360- 2D 24 3F 24 27 3C 24 25

9368- 2C 24 2D 24 3F 37 37 3E
9370- 36 37 36 2E 36 35 2E 06
9378- 00 49 29 2D 2C 24 25 2C
9380- 24 24 27 3C 24 27 3F 37
9388- 2E 35 2E 36 35 3E 36 37
9390- 3E 37 06 00 2D 2D 2D 2D
9398- 2D 2D 24 24 3F 3F 3F 24
93A0- 24 24 24 24 24 3F 3E 3E
93A8- 3E 3E 3E 3E 36 2D 2C 2C
93B0- 2C 2C 36 36 36 3F 3F 3F
93B8- 3F 36 00 2D 2D 2D 2D 2D
93C0- 2D 2D 24 3F 3F 3F 3F 3F
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9418- 37 2E 2D 2D 2D 2E 2E 3E
9420- 3E 3F 3F 3F 27 27 3F 36
9428- 35 35 00 49 49 49 2D 24
9430- 24 24 2C 2D 24 3F 27 24
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9480- 3F 27 27 3F 36 35 35 00
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The Apple Clinic

by Earle Hancock

• Cursors—Foiled Again! • Double Display • Resurrecting Track 35

Hello again! Let's dip into this month's mailbag...

The Cursor Blinks— All Else Is Gone!

I am very glad to see do-it-yourself articles for Apple II owners. Most problems probably could be cleaned up easily if we understood our machines and the way they work. My thanks to you and to Wayne Green.

I have an Apple II Plus with 48K, a language card, Grappler card, two disk drives and an Epson printer. At the moment I have two unresolved problems.

Oftentimes I'll leave my Apple with a program stopped at a random point while I perform some household chore. When I return, the cursor is flashing and everything looks O.K., but there is no response to the keyboard—not even to Reset. The only thing left to do is to re-boot and start over.

Have you any idea which part of the circuit might cause this problem? Could the problem be heat-related? Ambient temperature was between 75 and 80 degrees at the time. I have now positioned a small desk fan to the left of the Apple, and the small amount of air circulation has helped.

The second problem is the "on" light at the lower left of the keyboard. Occasionally it flickers, but this doesn't seem to affect the operation of the machine. The electric circuit reserved exclusively for my Apple runs directly to the main house panel. I have observed no other electrical disturbances in the house. If the panel bulb is defective, is there another source of parts other than my friendly Apple dealer?

Finally, can you recommend any books or diagnostic devices I should acquire to help me understand and service my own equipment?

S. Joan
Pontiac, MI

Thank you for your kind words. It's helpful to know we are meeting our readers' needs.

The solution to your first problem—loss of computer function—could be quite complex. If your Apple was being used for business purposes I would strongly recommend replacing the main logic board (motherboard). This would correct the problem quickly and surely. Apple Computer repair procedures make board replacement easy and inexpensive. Board replacement is a "shotgun" approach, but in many cases it may be the best cure.

Since placing a fan near your Apple helped with the problem (I assume it "went south" less often), heat is definitely a factor in the failure. You may want to install a more effective fan (The System Saver from Kensington Microware, for example).

If neither of these ideas appeals to you, the next plan is "chip swapping." Many a good chip and temper have been ruined using this procedure. It will help if you follow some simple rules. Always ground yourself by touching the power supply case inside the Apple. Remember that the computer must be plugged into a grounded wall socket for best results. Proceed in a slow, relaxed, methodical manner. Use an IC extractor and small screwdriver to remove the

chips. Take care not to bend the legs.

You will need a "known good" set of integrated circuits or a working Apple from which to swap. If you can find a friend willing to let you swap parts from his/her computer, more power to you. Where to start is often guesswork. It's wise to use a spray coolant on overheated components.

Off the cuff, this problem sounds like intermittent RAM failure (thanks, Cathy). Use a RAM test program and leave it on "continuous test" to see if your RAM is O.K.

The second problem (power indicator light flashing), as you correctly assumed, does not affect the Apple's operation. The bulb is a 5-volt "wheat" style model with long, thin wire legs. The legs slip into two tubes at the base of the light holder. You must remove both the white "power on" indicator cap (with gentle pressure from a screwdriver) and the bulb to see where the connection is made. The connection is not as tight as it might be; even a small amount of tarnish will cause intermittent or total failure. Remove and carefully clean the legs with alcohol and reinsert them (perhaps doubling the legs over for a more secure fit). Then replace

Earle Hancock has directed the microcomputer project at Minuteman Regional Vocational School, Lexington, MA, for three years. He has served as an advisor to the Massachusetts Association of Vocational Administrators, and is an active member of the Boston Computer Society and other computer organizations. Address correspondence to him c/o in-Cider, Pine St., Peterborough, NH 03458.

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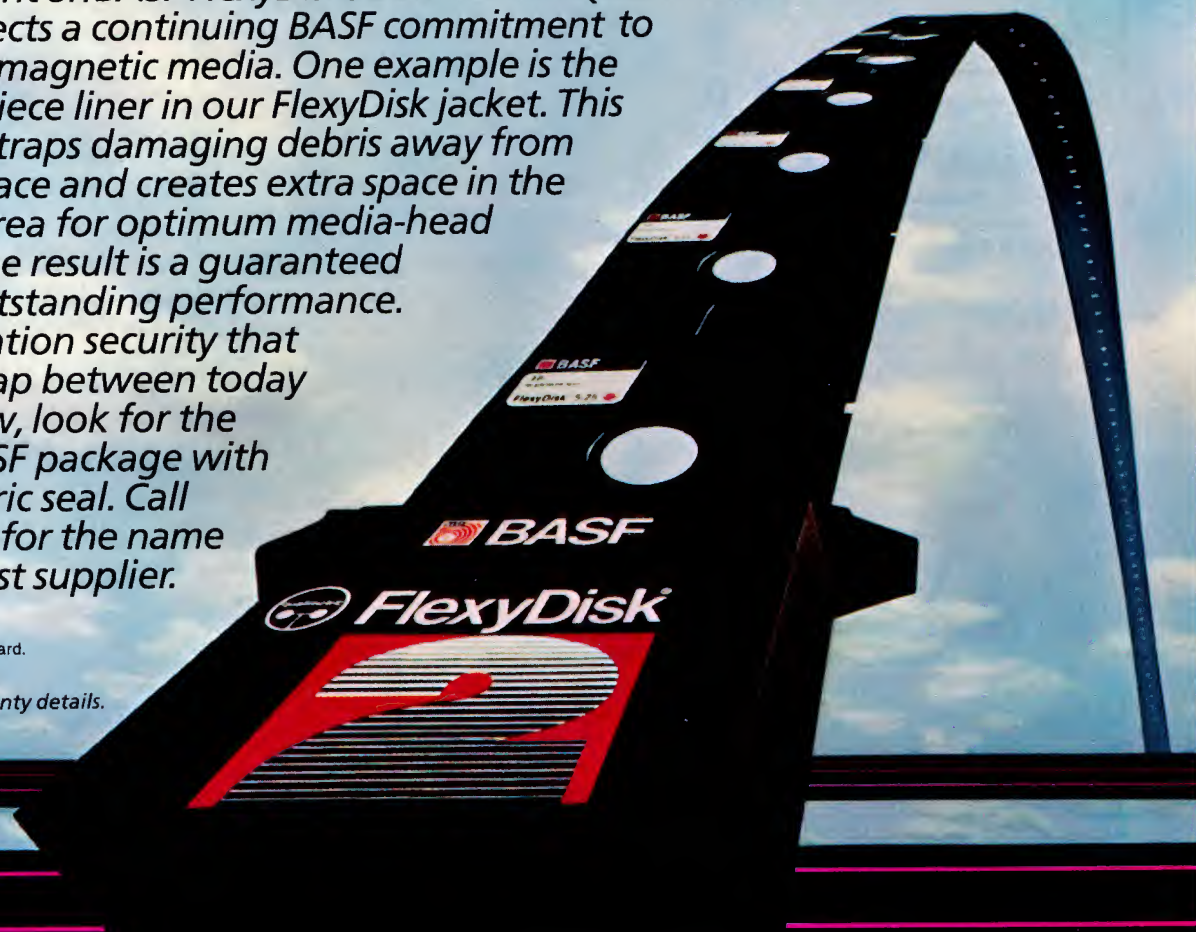
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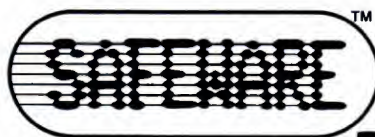
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the white cap. Apple IIe owners must remove the case to reach the bulb and socket in the keyboard.

In the January *inCider* I briefly reviewed two diagnostic packages for the Apple II Plus (see page 172). Microcomputer repair books are difficult to find. One that comes to mind is *Don't—Or How to Care for Your Computer* by Rodney Zaks, published by Sybex, 2344 Sixth Street, Berkeley, CA 94710. This is a general overview of computer care and does not offer model specific repair instructions. It does, however, present in a clear and humorous way steps to follow to help insure "years of trouble-free operation."

For more theory-oriented readers I recommend the *Heathkit Electronics Learning Dictionary*, published by the Heath Co., Benton Harbor, MI 49022. It contains definitions of approximately 20,000 terms unique to electronics and related fields. It's a well-written and useful reference.

Your best bet (ahem) is to continue to read *The Apple Clinic*!

Double Display 256 Spaces Away

I have a problem with 70/80 column display on my Amdek Color II monitor with the 80-column card and with software-driven display. When I input data, I get a cursor and a second display of the same typed input 256 spaces away.

Amdek sent me a new RGB card, but I still get a double display. Apple and Videx had no solution either. By substitution I have attributed the problem to either the Amdek card or monitor.

Thank you in advance for your help.

D. Pulsipher
Warson Woods, MO

Problems like this are difficult; there are so many variables to consider. No cause jumps to mind that would create the "double display." However, I can suggest a method for narrowing the possible causes down to a manageable few.

The combination of parts in a computer system can, collectively, cause unexpected things to happen. When I encounter a strange new problem like yours, I remove as many interface cards and system accessories as possible. In your case I recommend that you connect a composite video monitor to your Apple (preferably one that is "known good").

Remove all cards, including the disk interface. Test this combination by typing each key and verifying same on screen. If it works, add the disk interface and disk, test the key-

**"The combination of parts
in a computer system can,
collectively, cause unexpected
things to happen."**

board again and test all the RAM and ROM using a test package, or have your dealer run the test. Assuming all goes well, you'll have determined that the Apple and its composite video are O.K.

Now add the 80-column card, plug the "known good" monitor into the card and test. Still O.K.? If so, remove the Videx card and set up the RGB card and Amdek monitor and test again. If all is well with the 80-column card and the "known good" monitor, and if the RGB card and monitor (without the 80-column card installed) are good, your problem sounds like a weird compatibility issue. My guess is that you will find a problem along the way that if corrected will solve the whole situation.

During all the card swapping and such, remember to turn off the power before adding or removing cards. Not doing so could be very damaging to your Apple.

I've never been a fan of RGB monitors for 80-column text work (see January's *Apple Clinic*), but surely this "double display" problem is more than a preference issue. Keep me posted.

More Storage Space, Please

Can the alignment stopper (or some other piece on the older Apple or Shugart drives) be easily changed to allow track 35, or tracks 35-39, to be initialized? I assume the alignment stopper is the problem. Also, what about half-tracking to get double density (70-track) disks? Is this controlled by hardware or software? Such capability would be especially useful for lower cost back-up libraries.

R. Moredock
Campbell, CA

The Apple II disk drives, old and new, can actually step the read/write head 70 increments in the space of the "window" opening in the disk. Because of the width of the read/write head, however, it is not possible to select each of the 70 tracks without overwriting the space reserved for the next track.

What the disk operating system (DOS) does is to step the read/write head twice for each track on the disk. The result is the 35 tracks we are used to. If the read/write head were narrower, and if DOS were modified to step the head once for each track, we

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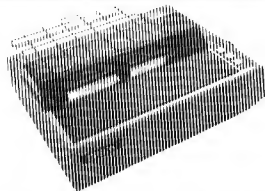
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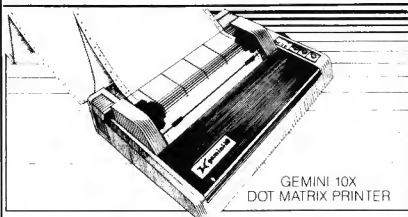
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The Apple Clinic

indeed could have 70 tracks or twice the storage space.

The confusion regarding how many tracks an Apple II drive can use arises, I believe, from a procedure called "half-tracking." Half-tracking is one of many protection schemes devised to keep users from copying disks.

Half-tracking shifts the start of each track to a position 1/2-step away. Tracks once labeled 0, 1, 2, ... 34 are then labeled 0.5, 1.5, 2.5, ... 34.5. No space is gained on the disk. Many people falsely assume that half-tracking means a new track is written in between each existing track, yielding 35 new tracks.

Bob Brownhill's excellent article, "Disk Space—The Final Frontier," in the November *inCider* explains how to get at track 35 (the 36th track). It requires a modification to DOS; therefore, it is software-controlled.

A New Adventure Game— Find the Cursor

The cursor on my Apple II Plus no longer appears on the screen. We replaced the 555 cursor flasher I/C at position B3 in accordance with our Apple II (Jan. 1978) Reference Manual, but that did not correct the problem. When I called the service department, they told me it involved removal of the motherboard which would cost \$50.

Can you be of any help in this matter?

L.A. Duff
Palmyra, NJ

One computer has nothing but the flashing cursor and another has everything except the cursor. Who said computing was dull?

You appear to have done the right thing by replacing the 555 cursor flasher I/C. It may be that the replacement is defective. To be safe, try replacing I/Cs one at a time, testing for results with each replacement.

If you don't know how to locate I/Cs on the motherboard, the "B" refers to row B and the "3" to column 3.

There are 9 rows, A to K, and 14 columns, 1 to 14, on the Apple II and II Plus motherboards. Locating an I/C is like finding a cell in VisiCalc, except A1 is in the lower left corner—not the upper left. You often will find an I/C referred to by both the number of the chip and its position on the board.

Here are the I/Cs to try: 74166-A3, 74S86-B2, 74LS08-B11, and 74LS02-B13. One of these should solve the case of the missing cursor.

By the way, your dealer's estimate of \$50 for repair of this problem seems fair. You may wish to let him/her do the work for you.

"One computer has nothing but the flashing cursor and another has everything ex- cept the cursor. Who said computing is dull?"

Too Much of a Good Thing

My Apple II Plus has developed a most aggravating condition. For the first five minutes or so after I turn the computer on, some of the keys auto repeat. The letter "T" is the most troublesome offender. This condition developed about eight months after I bought the computer.

Sometimes a letter will repeat itself three or four times after a normal keystroke. After the computer has been on for five minutes or so, the problem goes away and the letters no longer auto repeat.

I've received conflicting advice from two local repair places. One tells me I need a new keyboard—the other tells me I need a new encoder board.

Any light you can shed on this matter would be greatly appreciated.

T. Broughton
San Juan Capistrano, CA

The problem you describe is almost certainly the result of a malfunctioning encoder board.

The keyboard on an Apple II and II Plus sends messages (the keypress) to the encoder board, a small auxiliary board attached to the underside of the keyboard. In turn, the encoder board sends the keypress to the motherboard via the 16-pin connector plugged into position A7.

If the keyboard were at fault, you would have trouble with one or a few keys, but the rest would work correctly. I am a bit suspicious of the "T" key giving you more trouble than the rest. That key may need to be replaced.

Somewhere in the encoder board's circuit is a component or a trace that is sensitive to cold. You could find the exact problem by spraying a diagnostic aid referred to as "cold spray." When the defective area is cooled off, the auto repeat problem should show up. Repeat the process several times to verify that you've found the problem. This procedure is not for beginners, so if you decide to try it, do so with caution!

My recommendation is to have the dealer who suggested a new encoder board fix the computer for you. It will probably be fixed faster, and Apple guarantees the new part for 90 days.

Many Requests for this Information

I just read your article in inCider about disk drive repair. I enjoyed it and would like to learn more.

I am the computer "expert" in our high school of 250 students. I have set up a room with 11 Apple IIe computers to implement a program of programming and computer assisted learning. I also have become the resident "technician" because Harbor Springs is located in northern Michigan (read isolation). I have an electronics background in ham radio and feel that I could solve many minor computer repair problems.

Please recommend a good repair guide. List any special tools which may help. What about diagnostic equipment? Where can I get specific technical information? Who is the best supplier of parts?

B. Slotnick
Harbor Springs, MI

The Apple Clinic received many letters this month asking the same question: What do I do to get ready for the inevitable?

Even though this column is devoted to self-help repair, many people never have had a repair problem with their equipment. The school where I work has 40 Apples or Apple work-alikes. Sometimes several months go by without any trouble. But back to the inevitable.

I know of no books or guides specific to microcomputer or disk drive repair currently on the market, although the previously mentioned general information books may be useful.

Tool selection is largely a personal issue. Some people, like me, see tools as works of art and must have just the right tool for the job. Others take a more utilitarian view and can make do very nicely with a minimum selection. Flat blade and Phillips head screwdrivers, a set of watch screwdrivers (Archer makes a set sold in Radio Shack stores), a 20 thousandths-inch feeler gauge, an IC extractor, a pair or two of needlenose pliers, and a soldering gun and solder sucker should be enough to get you started.

For specific technical information I recommend the *Apple II Reference Manual* (Apple part #A2L0001A [030-0004-01]). Apple IIe owners will have to wait for someone to publish a reference manual for them.

The best supplier of parts and helpful hints is your Apple dealer. Even if the dealer is far away, it definitely pays to establish a good working relationship with the dealer and his repair technician. Explain your particular situation to them and enlist their cooperation. This relationship can be extremely helpful to you and beneficial to the dealer as well.

Keep Those Cards and Letters Coming

Response to The Apple Clinic has been gratifying. Do you have a problem with your Apple? Explain it to me and perhaps I can help. I'm waiting to hear from you! ■

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Get Control of Your Apple Dot Matrix Printer

by Hobart S. Cable, II

```
[V]ESCn[V] This is 9 cpi NORMAL print.
[V]ESC! [V] This is 9 cpi BOLD print.
[V]ESC"[N][V] This is 9 cpi ELONGATED print.
[V]ESC! [V] This is 9 cpi BOLD ELONGATED print.
[V]ESC"[O]ESCn[V] This is 10 cpi Pica NORMAL print.
[V]ESC! [V] This is 10 cpi Pica BOLD print.
[V]ESC"[N][V] This is 10 cpi Pica ELONGATED print.
[V]ESC! [V] This is 10 cpi Pica BOLD ELONGATED print.
[V]ESC"[O]ESC! [V] This is 12 cpi Elite NORMAL print.
[V]ESC! [V] This is 12 cpi Elite BOLD print.
[V]ESC"[N][V] This is 12 cpi Elite ELONGATED print.
[V]ESC! [V] This is 12 cpi Elite BOLD ELONGATED print.
[V]ESC"[O]ESCq[V] This is 15 cpi NORMAL print.
[V]ESC! [V] This is 15 cpi BOLD print.
[V]ESC"[N][V] This is 15 cpi ELONGATED print.
[V]ESC! [V] This is 15 cpi BOLD ELONGATED print.
[V]ESC"[O]ESCq[V] This is 17 cpi NORMAL print.
[V]ESC! [V] This is 17 cpi BOLD print.
[V]ESC"[N][V] This is 17 cpi ELONGATED print.
[V]ESC! [V] This is 17 cpi BOLD ELONGATED print.
[V]ESC"[O]ESCP[V] This is Proportional-1 NORMAL print.
[V]ESC! [V] This is Proportional-1 BOLD print.
[V]ESC"[N][V] This is Proportional-1 ELONGATED print.
[V]ESC! [V] This is Proportional-1 BOLD ELONGATED print.
[V]ESC"[O]ESC! [V] This is Proportional-2 NORMAL print.
[V]ESC! [V] This is Proportional-2 BOLD print.
[V]ESC"[N][V] This is Proportional-2 ELONGATED print.
[V]ESC! [V] This is Proportional-2 BOLD ELONGATED print.
[V]ESC"[O]ESCn[L][V]
```

Figure 1. Print mode test file.

```
This is 9 cpi NORMAL print.
This is 9 cpi BOLD print.
This is 9 cpi ELONGATED print.
This is 9 cpi BOLD ELONGATED print.
This is 10 cpi Pica NORMAL print.
This is 10 cpi Pica BOLD print.
This is 10 cpi Pica ELONGATED print.
```

Figure 2 continued.

When I purchased my Apple III system recently, one of my first priorities was to get the Apple Dot Matrix Printer (they're calling it the "DMP") up and running. This would seem to be a simple task, but the Operator's Guide is really only an installation manual, and the Reference Card is short on instructions. (The people at Apple Computer have assured me that an in-depth DMP manual is being printed and will be available soon.) After wrestling with the best way to configure the printer with the internal DIP switches (you must be sure to turn the printer off and back on for new settings to be effective), I turned to testing the various print modes available.

The file shown in Figure 1 is the result. If you combine the DMP's four different print styles with its seven print sizes, you have 28 possible print modes. These are all demonstrated in this exercise.

While this is an Apple Writer III text file developed on my Apple III, it can be easily adapted for Apple Writer II on the Apple II. You should configure the Apple Writer Print/Program menu for normal printing, with double spacing.

In Figure 1 I have used the standard Apple Writer notation, where [V] means control-V, and so on. ESC stands for the escape key. Note that certain mode changes do not use

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Name _____

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Figure 2 continued.

This is 10 cpi Pica BOLD ELONGATED print
 This is 12 cpi Elite NORMAL print.
 This is 12 cpi Elite BOLD print.
 This is 12 cpi Elite ELONGATED print.
 This is 12 cpi Elite BOLD ELONGATED print.
 This is 15 cpi NORMAL print.
 This is 15 cpi BOLD print.
 This is 15 cpi ELONGATED print.
 This is 15 cpi BOLD ELONGATED print.
 This is 17 cpi NORMAL print.
 This is 17 cpi BOLD print.
 This is 17 cpi ELONGATED print.
 This is 17 cpi BOLD ELONGATED print.
 This is Proportional-1 NORMAL print.
 This is Proportional-1 BOLD print.
 This is Proportional-1 ELONGATED print.
 This is Proportional-1 BOLD ELONGATED print.
 This is Proportional-2 NORMAL print.
 This is Proportional-2 BOLD print.
 This is Proportional-2 ELONGATED print.
 This is Proportional-2 BOLD ELONGATED print.

lects "bold" and [O] deselects "elongated" from the previous line, ESCN selects 10 cpi Pica, and the final [V] terminates control codes.

If you make an Apple Writer text file as in Figure 1 and send it to the printer, the result should be as shown in Figure 2. The last line in Figure 1 resets the printer for normal print and advances to the next page. Be sure to use the control key instead of the brackets for typing each control code. You can also add a sample character set to each mode as in Figure 3. Switch to single spacing if you want to get it all on one page.

This exercise is far from a complete demonstration of the many capabilities of the Apple DMP. Using these same techniques you can experiment further and exercise additional features of this versatile printer. ■

ESC. Where the Reference Card shows the ASCII SO and SI values, you must use the equivalent control characters, N and O.

The Apple Writer [V] mode allows entry of control codes into a normal text file, and that is how this exercise configures the DMP for the demonstration. Using the fifth line of Figure 1 as an example, the first [V] initiates the control code feature, ESC" dese-

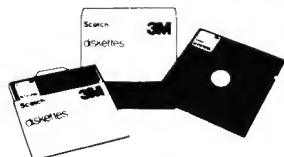
This is 9 cpi NORMAL print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 9 cpi BOLD print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 9 cpi ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 9 cpi BOLD ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 10 cpi Pica NORMAL print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 10 cpi Pica BOLD print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 10 cpi Pica ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 10 cpi Pica BOLD ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 12 cpi Elite NORMAL print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 12 cpi Elite BOLD print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 12 cpi Elite ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 12 cpi Elite BOLD ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 15 cpi NORMAL print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 15 cpi BOLD print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 15 cpi ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 15 cpi BOLD ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 17 cpi NORMAL print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 17 cpi BOLD print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 17 cpi ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is 17 cpi BOLD ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is Proportional-1 NORMAL print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is Proportional-1 BOLD print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is Proportional-1 ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is Proportional-1 BOLD ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is Proportional-2 NORMAL print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is Proportional-2 BOLD print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is Proportional-2 ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z
 This is Proportional-2 BOLD ELONGATED print.
 0123456789ABCDEFGHIJKLMN0PQRSTUVWXYZabcde fghij klmnopqrstuvwxy z

Figure 3. Printout from test file, with sample character set.

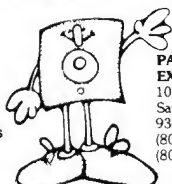
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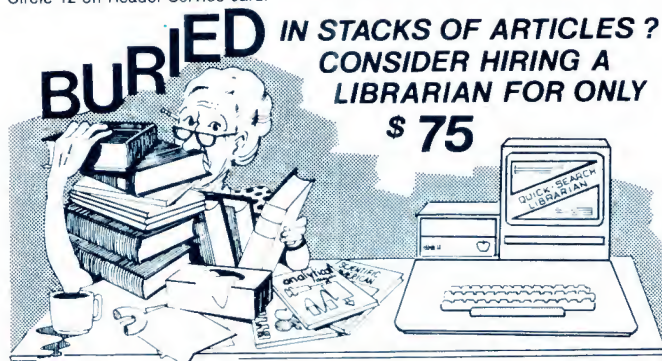


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Precision Dumping

by L. S. Reich

Several Applesoft and assembly language programs for text screen dumping to printer have recently been presented for the Apple II. However, none of these programs has any provision for controlling the amount of text screen display that is dumped. Thus, for example, if the upper portion of the display consists only of a few lines and the remainder of the screen is blank, that's what the printout will look like. Such lack of printer control is often undesirable and irksome.

In this report, an assembly language program (ASL) and a corresponding Applesoft Basic (ASB) program are presented which allow the user to precisely control the amount

of text screen display that is dumped to printer.

The ASL Program

Listing 1 shows an assembly language program for controlling the amount of text screen dump to an Epson printer. This program should also be applicable to other printers with cards equivalent to the Apple II parallel interface card.

In lines 34-46, input hooks (KSWL/H) are set so that text screen printing will commence when a control-P is detected while in monitor mode. Also, registers A, X, Y and P are saved along with the horizontal cursor position (CH) in lines 48-50. Printer parameters are then em-

ployed which are applicable to an Apple parallel printer interface in slot #1 or an equivalent interface (lines 51-54). These parameters are stored inside the screen buffer memory between \$0400-\$07FF, but are in bytes that are not displayed.

Lines 56-60 start the determination of text screen contents. Inverse or flashing characters are converted to normal ASCII codes for printing (lines 61-65). Lines 61 and 67-89 test for either a blank space or blank line followed by the marker REM* beginning at the leftmost position of the very next line (no prompt). If such a marker is detected, CH and the registers are restored and printing stops (lines 110-114).

However, if the preceding conditions are not met, printing is restored and the Y register acts as a column counter and the X register as a line counter (lines 94-108). When the end of a line is reached a carriage return is printed and another line may be printed, provided the end of the screen has not been reached or the "stop printing" conditions have not been met.

The ASB Program

An Applesoft Basic program corresponding to the assembler program is depicted in Listing 2. This listing employs Lam's routine (reference 6) to enter values into the monitor from Basic. The input hooks are set in line 40. Thus, an assembler program may be stored as part of a Basic program.

The marker REM* was used to limit the amount of text screen dumping to

Listing 1. Assembly language program.

```

4 *****
5 *
6 *CONTROLLING THE AMOUNT OF *
7 *SCRN-DUMP TO EPSON PRINTER*
8 *
9 *COPY LIMIT MARKER: AT END,*
10 *USE BLANK LINE FOLLOWED BY*
11 *'REM*' AT LEFTMOST MARGIN *
12 *(NO PROMPT)
13 *
14 *'BRUN (THIS PGM NAME).OBJ'*
15 *THEN, IN MON, USE CTRL-P; *
16 *FROM A-BASIC, CALL-32742 *
17 *
18 ***BY L.S. REICH **** 3/83*
19 *
20 *****
21 *
22 CH      =    $24
23 BASL    =    $28
24 BASCAL  =    $FBC1
25 VTAB    =    $FC22
26 RDKEY   =    $FDOC
27 KEYIN   =    $FD1B
28 DOSHOK  =    $3EA
29 SLOT    =    1
30 PRINT   =    $C102
31 COUNT   =    $5F8+SLOT
32 NOVID   =    $778+SLOT
33 *
34 LDA     #<PRNT
35 STA     $38          ;SET
36 LDA     #>PRNT      ;INPUT
37 STA     $39          ;HOOKS
8000: A9 0C
8002: 85 38
8004: A9 80
8006: 85 39

```

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Hints 'n' Techniques

the printer, because by following this marker with RETURN no syntax error

results. Also, when listing an Apple-soft program, REM is automatically

```

8008: 20 EA 03 38      JSR DOSHOOK
8009: 60              RTS
                        *
800C: 20 1B FD 41      PRNT      JSR KEYIN
800F: C9 90 42        CMP #90      ;CTRL-P
8011: D0 06 43        BNE Y1
8013: 20 1A 80 44      JSR PRINTER
8016: 4C 0C FD 45      JMP RDKEY
8019: 60              RTS
                        *
801A: 20 4A FF 48      PRINTER JSR $FF4A      ;SAVE REGS
801D: A5 24 49        LDA CH
801F: 48 50          PHA
8020: A9 28 51        LDA #40      ;INSERT
8022: 8D F9 05 52      STA COUNT  ;PRINTER
8025: A9 01 53        LDA #1       ;PARAMS
8027: 8D 79 07 54      STA NOVID
                        *
802A: A2 00 55        LDX #0       ;START
802C: 8A 57          TXA          ;TO
802D: 20 C1 FB 58      JSR BASCAL  ;DETERMINE
8030: A0 00 59        LDY #0       ;CONTENTS
8032: B1 28 60        LDA (BASL),Y  ;OF THE
8034: C9 A0 61        CMP #A0      ;TEXT
8036: B0 04 62        BGE Y5      ;SCREEN
                        *
8038: 69 40 64        ADC #40      ;INVS/FLSH
803A: D0 FB 65        BNE Y4      ;CHARS
                        *
803C: E8 67          *
803D: 8A 68          Y5
803E: 20 C1 FB 69      JSR BASCAL
8041: 98 70          TYA
8042: 48 71          PHA
8043: A0 00 72        LDA #0       ;IN LFTMOST
8045: EA 73          NOP
8046: B1 28 74        LDA (BASL),Y ;NO PROMPT
                        *
8048: C9 D2 76        CMP #D2      ;LTR. R
804A: D0 1A 77        BNE X1
804C: C8 78          INY
804D: B1 28 79        LDA (BASL),Y
804F: C9 C5 80        CMP #C5      ;LTR. E
8051: D0 13 81        BNE X1
8053: C8 82          INY
8054: B1 28 83        LDA (BASL),Y
8056: C9 CD 84        CMP #CD      ;LTR. M
8058: D0 0C 85        BNE X1
805A: C8 86          INY
805B: B1 28 87        LDA (BASL),Y
805D: C9 AA 88        CMP #AA      ;ASTERISK
805F: D0 05 89        BNE X1
8061: 68 90          PLA
8062: AB 91          TAY
8063: 4C B1 80 92      JMP Y6      ;END COPY
                        *
8066: CA 94          X1
8067: 8A 95          DEX
8068: 20 C1 FB 96      JSR BASCAL ;RESTORE
806B: 68 97          PLA          ;PREVIOUS
806C: AB 98          TAY          ;CONDITION
806D: B1 28 99        LDA (BASL),Y
806F: 20 02 C1 100     JSR PRINT
8072: C8 101         INY
8073: C0 28 102        CPY #40      ;40 CHARS
8075: 90 BB 103        BLT Y3      ;PER LINE
8077: A9 BD 104        LDA #8D
8079: 20 02 C1 105     JSR PRINT  ;C/R
807C: E8 106         INX
807D: E0 18 107        CPX #24      ;24 LINES
807F: 90 AB 108        BLT Y2      ;PER PAGE
                        *
8081: 68 109         *
8082: 85 24 110        Y6
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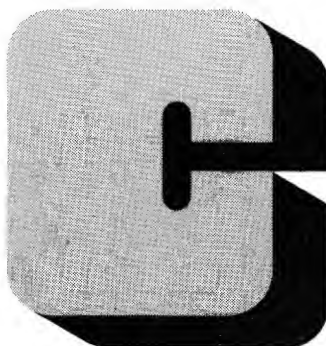
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8 TEXT : HOME
10 REM **APPLESOFT VERSION OF ASL FGM. FOR CONTROLLING AMT. SCRIN. DUMP TO
  PRINTER**
20 IF PEEK ( - 32752) = 144 THEN 40: REM DON'T DUPLICATE LAM ROUTN
30 GOSUB 100: REM LAM ROUTN
40 CALL - 32768
50 END
100 A$ = "8000:A9 0C 85 38 A9 80 85 39 20 EA 03 60 20 18 FB C9 90 D0 06 20
  1A 80 4C 0C FD 60 20 4A FF A5 24 48 A9 28 8D F9 05 A9 91 8D 79 07"
110 GOSUB 200
120 A$ = "802A:A2 00 8A 20 C1 FB A0 00 B1 28 C9 A0 B0 04 69 40 D0 FB EB 8A
  20 C1 FB 98 48 A0 00 EA B1 28 C9 D2 D0 1A CB B1 28 C9 C5 D0 13 CB B1
  28 C9 CD"
130 GOSUB 200
140 A$ = "8058:D0 0C C8 B1 28 C9 AA D0 05 68 A8 4C 81 90 CA 8A 20 C1 FB 68
  A8 B1 28 20 02 C1 CB D0 28 90 EB A9 8D 20 02 C1 EB E0 18 90 AB 68 85
  24 20 22 FC 20 3F FF 60"
150 GOSUB 200: RETURN
200 A$ = A$ + " N D9C68": FOR I = 1 TO LEN (A$): POKE 511 + I, ASC ( MID$
  (A$,I,1)) + 128: NEXT
  I
210 POKE 72,0: CALL - 144: RETURN

```

Listing 2. Applesoft Basic program.

followed by one or more spaces. Of course, when entering a message on the screen that is to be printed, a space should always follow REM in order to avoid a premature print halt.

When the Applesoft Basic program is run, the input hooks are set (for control-P) and the appropriate assembler code enters the monitor. The text screen may then be filled with characters, some of which are to be

printed (e.g., by loading and listing a Basic program). After the user decides what portion of the screen is to be printed, a blank line is entered immediately after the last line. This is followed in the next line, in the leftmost position (no prompt), by the marker REM* and a return. Then, the use of CALL-32742 should yield the desired result (CTRL-P in monitor mode may also be used).

When the assembler program is

employed to control the amount of screen display dumped to the printer, the BSAVE'd program (BSAVE program name, A\$8000,L138) is BRUN. The text screen is next filled with characters to be printed. The blank line and REM* marker are then entered as described previously. The use of control-P (in monitor mode) will activate the printer and produce the desired results. ■

References

1. R.M. Mottola, *MICRO*, 14:27 (1979)
2. B. Sander-Cederlof, *Apple Assembly Line*, 1, 5 (1981)
3. A. Christopher, *Softalk*, p. 15 (Nov. 1981)
4. J. Branch and S. Freeman, *Nibble*, 3, 147 (1982)
5. U. Schlichtmann, *Apple Assembly Line*, 3, 12 (1983)
6. V.J. Golding, *Call-A.P.P.L.E. in Depth*, #1, p. 30 (1981)

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inCider's inSidious inSolubles

by Art Ude

Sure, I studied books about how to program in Basic, but the most useful method of learning I know is typing in all those listings that appear in computer magazines. That, and debugging my own programming errors, proves a most effective way to learn. While I was editor of a local user group newsletter, the idea struck me: Why not combine these two inexact instruction methods into one, short bug-infested program? I tested the idea in the newsletter for a few months and it received a positive response, so I suggested a similar venture to *inCider*.

Each month *inCider* will list a short Basic Applesoft program that will seem to run correctly, but there will be something wrong. Oh, you won't see anything so obvious as SYNTAX ERR or any other ERR for that matter; however, that programmer's sixth sense that you have developed, slaving over a hot keyboard, will "tell" you something is amiss. The answer will be elsewhere in this issue. Some solutions will be very easy, some a lot harder. Some will be "cute," some will be tricky.

Here are a few guidelines and suggestions:

1. The Basic programs are in straightforward Applesoft. Any poked machine language subroutines and CALLS to that subroutine are correct.
2. You should get some kind of a result from the programs; in other words, they shouldn't crash.
3. You should not get an ERR message of any kind. If you do, check your typing.
4. There will be a short explanation of what the program is supposed to do. Read this explanation *carefully*. It may contain clues to the problem.
5. The program will run on any version of an Apple II with Applesoft. The

program may make use of common peripherals such as a disk drive, printer, modem etc., but will make note of this in the explanation.

6. There may be more than one error in the program.

The folks at *inCider* encourage their readers to submit their own inSidious inSolubles. While there is no length limit, the shorter the better. All submissions should contain the correct solution and conform to all the above specifications. If your program is especially ingenious, you will receive either a free 12-month subscription to *inCider*, or a 12-month extension of your present subscription. Take a whack at it!

* * *

The Chess Board

This program (see Listing 1) draws a chess board on the Apple's lo-res screen. Now, think carefully. What's wrong with The Chess Board?

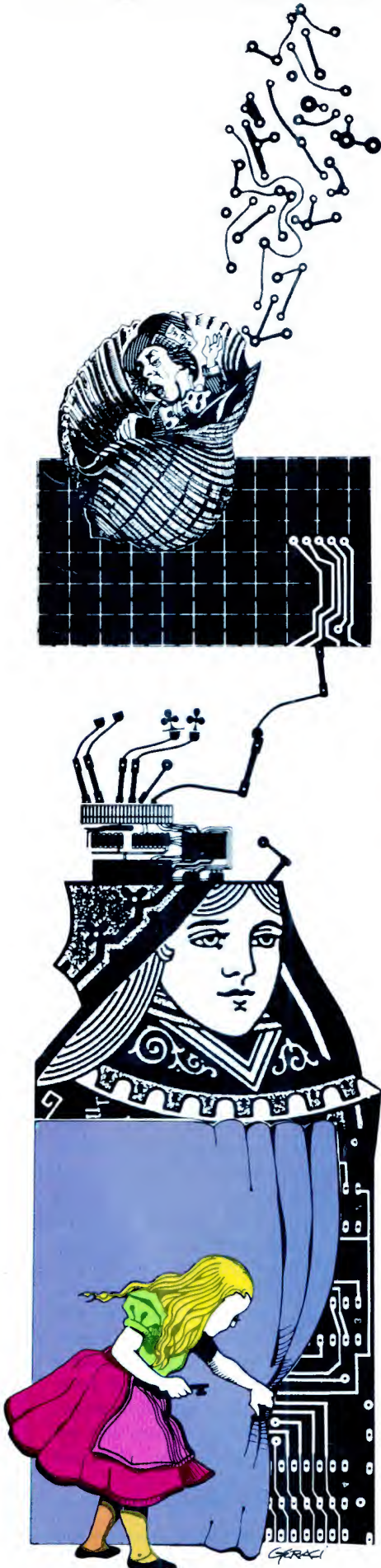
Solution on page 174.

```

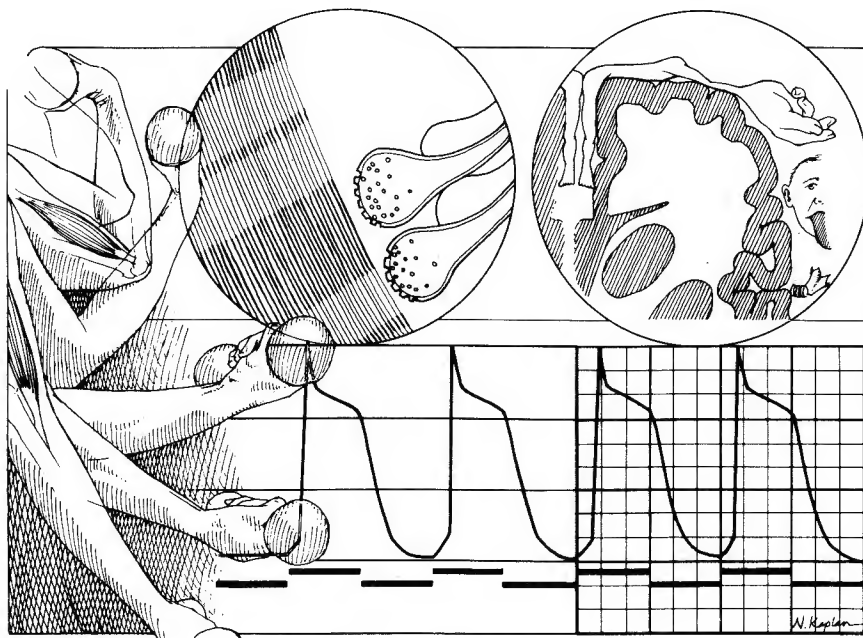
10 TEXT : HOME : L = 0 : GR
20 FOR X = 0 TO 35 STEP 5 : Y = L
30 COLOR = 0 : IF (X + Y) / 10 < >
   INT ((X + Y) / 10) THEN COLOR =
   15
40 FOR Y = L TO L + 4
50 HLIN X,X + 4 AT Y
60 NEXT Y : Y = 0 : NEXT X
70 L = L + 5 : IF L > 35 THEN END
80 GOTO 20
    
```

Listing 1. The Chess Board.

Submit your own inCider inSidious inSolubles to Art Ude, c/o inCider, 80 Pine St., Peterborough, NH 03458.



Software Reviews



Neuromuscular Concepts

Are you a biology teacher whose students need some individualized practice in understanding neuromuscular concepts? Or perhaps you're a college student who needs a quick review and self-testing before the midterm or final examination. If so, Biosource Software has produced a three-disk package which may help you.

Neuromuscular Concepts is designed to be run on a 48K Apple II, II Plus or IIe with one disk drive and monitor.

Neuromuscular Concepts consists of five tutorials, a series of ten-question multiple choice quizzes, and more comprehensive 25- or 50-question review exams. All the tests have immediate feedback and, when completed, the student can see an assessment of his/her performance in each of the five areas covered—a handy feature when studying for an exam.

The tutorial sections cover five subjects: muscle action potentials, using the electromyogram, skeletal muscle contraction, muscles in action and disorders of movement. A glossary is provided with each section, but

most high school students will also need a dictionary.

Entrance into the glossary is very easy: You simply press G. Pressing R immediately returns you to the page you were on. All the tutorials are user-controlled, allowing the student to progress (or review) at his/her desired pace. The few necessary commands are simple and well documented. Likewise, error trapping is well done.

After each concept is presented, the student is asked a multiple choice question. When the answer is entered, it is defined; and if it is an incorrect choice, the student is instructed to try again. When the student chooses the correct answer, the reason for this answer is repeated too, serving as a reinforcement.

Of special note is the visual presentation of the program. All of the sections are clear and well spaced. The graphics are well executed and easy to understand, although I would like to see more labelling of specific parts of the diagrams, especially if the units are to be used by students new to this field of study.

The disks are sold as a stand-alone unit, but this software is designed to be used within a curriculum and the

authors have also produced a separate slide set for classroom use. A set of multiple choice tests is also available for classroom use at an additional cost of \$65. The publisher states that they will provide users with updates for the cost of postage and handling, or with back-up copies for \$15.

The documentation for Neuromuscular Concepts consists of four disk-size pages of clear and sufficient descriptions and instructions and a short bibliography. The short documentation is not a drawback since this is a user friendly system which displays the instructions on each screen seen by the student (in a style which doesn't interfere with the material itself). The screen instructions enhance the unit's usefulness in schools, where loose instruction sheets are often lost. The self-explanatory materials save time and avoid frustration for both student and teacher.

Neuromuscular Concepts can be purchased for \$49.95 from Biosource Software, 2105 S. Franklin, Suite B, Kirksville, MO 63501. Biosource has ceased copy protection after discovering that several commercial encryption systems do not tolerate minor disk drive misalignments. ■

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Apple II Plus or an Apple IIe. The instructions cover the use of an external speaker, but I found this wasn't necessary; the sound was clear without resorting to one. Only one disk is provided, but it can be copied using Apple's CopyA program.

Author John Paulson knows his audience. Under the heading of Getting Started there is a note that states by pressing Control-I the student can access instructions for each game and/or the menu and avoid reading the rest of the booklet. (I would recommend that parents read it so that they will be able to help a child using the disk.)

Choices are easily made even by non-readers; one of the two menus is a picture menu. When the series of pictures appears, the user can press any key to stop the menu at the desired game, which begins automatically. (You can also press the escape key at any time to exit from any game and return to the picture menu.) This approach gives a small child a sense of his/her ability to control the computer.

The top row of keys can be used to play musical notes, with each num-

ber-key assigned one tone of a diatonic scale. As the note is played it is shown on the screen either as the corresponding piano key or as a note on the treble or bass staff, according to the player's choice. The author, taking advantage of the fact that most small children are familiar with initial consonant sounds, uses P for the PLAYBACK command, S for SAVE, and L for LOAD, making the commands easy to remember. The space bar begins and ends recording and RETURN selects keyboard or clef presentations.

With an Apple IIe or an Apple II Plus which has been modified to have key-repeat abilities, the player will encounter a problem with note entry. If a key is held down for more than one beat, it will repeat until interrupted. This means that only relatively simple tunes can be played. Since the games are intended for use by young children, this is not really a major problem. When I spoke to a representative of Counterpoint Software, he acknowledged the situation but said that they had no plans for modification of the program at that time.

Guido's Quiz is a series of three programs designed to teach note names, piano key names and basic note reading. The first game pictures a partial piano keyboard. Each of the notes of a C major scale is labelled and sounded. Then one of the labels is replaced with a question mark and the player is asked to type in its name. After one guess, the name reappears and the note sounds again.

The second game shows the treble clef notes. A staff appears and then each of the notes from middle C to high G appear and are played. This game has three phases. First it shows all the note names but one, which is replaced by a question mark. When a note is guessed, it is eliminated from the picture. Finally, the question mark appears on an otherwise empty staff, and you must enter the note name.

In order to continue playing the game after you have made your guess, you must enter the correct note name. If you have entered the wrong name, the computer plays a scale while showing each of the notes and its placement. You are then asked again to enter the right note name. When you answer, the individual note remains while the others disappear from the screen. You have then entered the right answer. This same pattern is followed using the bass clef in the third game.

Melody Tutor is a "do what I do" game in which the student tries to play the same tune as the computer. Six nursery tunes are provided and are listed in the instructions. Other songs can be added to this list using the record/save/playback section of the disk. First the entire tune is played and each note appears on the keyboard graphics with the number of the corresponding computer key. Then, one note at a time is added which the student must echo by using the top row of keys on the computer. Some of the songs are quite long, and I found that entering short melodies into the list helped keep the attention of the younger players.

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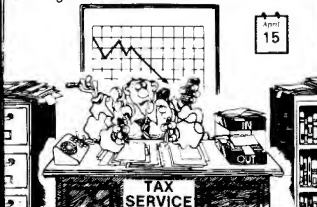
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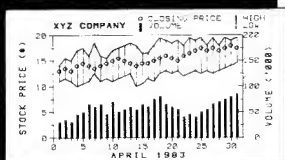
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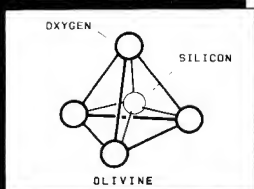
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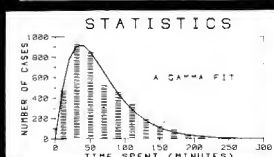
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Gregory MacNicol
InfoWorld September 5, 1983



"The Prime Plotter contains more power than any graphing package I have used." "It can do many things not found in other packages; I know of no competing program which can do as much!"

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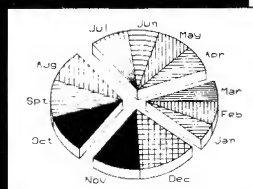


"The Prime Plotter is a surprisingly complete plotting package designed for a variety of applications. Routinely to create X-Y plots, 3-D charts, bar graphs, and figure charts make the product the most powerful plotting package the reviewer has seen." "The product is superb for creating 'slide-show' presentations of generic data."

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MICRO August 1983

The Prime Plotter	\$240	Plotter Interfaces:	
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Business Software
Vol. 1, No. 5, Sept./Oct. 1983

PEELINGS II Rating

The Prime Plotter	A +
Apple II Business Graphics	A -
PFS Graph	B
Versaplot	D

"In conclusion, if you are looking for the most powerful program for scientific or business use and are willing to spend several days learning the system, The Prime Plotter is your best choice."

Plotter Summary
PEELINGS II Vol. 4, No. 4, 1983

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If the wrong note is pressed, the computer plays a low flutter of notes and repeats the pattern to be played. Then the child can try again until he plays the entire song. It's good ear and memory training, and the small steps make it easy for any child to play a song.

In Kaleidoscore, each key is assigned both a tone and a low-resolution shape that appears in random colors, sizes and placement on the screen. As you play a tune, a pattern appears on the screen. Tunes can be recorded, saved and played back or loaded from memory. The same commands used in other programs are also used here; this consistency is one of the strong points of the Early Games programs.

This is undoubtedly the best set of music-teaching games I have seen yet. They would be a valuable purchase for any family with a music student from 4 through 10 years of age.

Early Games Music is published by Counterpoint Software, Inc., Suite 218, 4005 West 65th St., Minneapolis, MN 55426. The recommended retail price is \$29.99. ■

Janet Meizel
Davis, CA

SAT Series

Krell's College Board materials have some glaring flaws, but they scored well overall with the high school students who reviewed them with me. "If I had this stuff to help me study," said a boy who had recently tallied 400s, "I'd have scored 50 points higher." Actually, Krell guarantees a gain of 70 points (combined math and verbal scores) over the user's previous marks or the purchase price will be refunded.

The materials include six disks covering Verbal, Vocabulary, Test of Standard Written English 1 & 2 and Math 1 & 2. I worked with former students with previous SAT scores in the 400's, 500's, 600's and 700's to review the series. All agreed that the program directions are clear and that

the exercises are similar to the actual SAT format. Most complained, however, that some explanations for answers are unclear.

For example, one explanation read: "A semicolon is used between independent clauses joined by a coordinating conjunction if the clauses have internal commas." Another read: "The elliptical construction as often here requires the inclusion of the missing component 'as.'" Still, there

**"Krell guarantees
a gain of 70
points over the user's
previous marks."**

are enough good drills on diction, punctuation, subject/verb agreement, vocabulary and math skills to make the program worthwhile. "It's a lot more entertaining than studying those dull SAT review books," said one boy. "And at least you're interacting with something—even if it is only a machine."

One bright student with a penchant for math and computers pointed out that the math problems are well designed. "I especially like the feature that allows you to call up a new question similar to the one you just got wrong—that really helps." But the manufacturer missed a great opportunity, according to the same student, by failing to utilize graphics in the solutions. His other suggestion was echoed by the other students: "When I'm done working with the program," he said, "I'd prefer the computer to grade me on a 200 to 800 scale instead of telling me I scored 80 out of a possible 94 points."

The students and I found misspellings and grammatical errors in several programs. Meteorologist becomes meterologist, coefficient is sometimes spelled with one f, and the ancient fossil Trilobite becomes Tribolite.

A senior who recently scored in the 700's probably summed things up best. "The program definitely has

value," he maintained, "but because of some of those complicated explanations, it may well be most helpful to those students who need it least and least helpful to those who need it most."

One strong plus is the program's Automatic Learning feature. The math and vocabulary disks are designed to monitor the user's progress. The program then gives the user fewer questions of the type he has mastered and more of the type he hasn't. Krell also has some useful options (at extra cost) scheduled for 1984, including a worksheet generator and a classroom management system for school recordkeeping.

Krell's College Board SAT Preparation Series is distributed by Krell Software, 1320 Stony Brook Road, Stony Brook, NY 11790. The cost is \$299. ■

Mario Pagnoni
Methuen, MA

Financial Planning For VisiCalc

The powers of VisiCalc are a godsend to many in the financial community. Projects that once required tedious, repetitive, spreadsheet calculations are now easy and immeasurably faster. But for all of its benefits, the complexity of VisiCalc can be intimidating. The average financial and business person has little concept of the operating syntax of VisiCalc; he/she may be prone to dismiss it altogether as too difficult to learn.

With this in mind, several firms distribute ready-to-run application packages for use with VisiCalc. One such product is Financial Planning for VisiCalc and the Apple II. The package includes many of the most common financial planning routines in a VisiCalc-compatible format, offering the benefits of an electronic spreadsheet without the bother of setting up the sheet.

The result is twofold; since no set-up is needed, even first-time users can



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operate the system. Secondly, and perhaps more important, the spreadsheets are fully tested and debugged, eliminating the potential for errors. If you have ever set up a large spreadsheet, you know the grief that is caused by little errors such as misplaced parentheses in formulas. The larger the spreadsheet, the more potential for trouble.

There is no magic behind this financial planning package, nor are any of its formulas indecipherable to someone familiar with VisiCalc. There are, however, several formulas that would take quite a bit of figuring to come up with in the first place. Some of the formulas used are so involved that they do not fit completely on the edit line when examined or modified.

Calculations included in the package are compound growth, annuities, statistics and a section on real estate financing. Even if these programs do not give the exact information you need, the templates are easy to modify. Starting from their basic structure, you can change things until the format suits you.

The program requires 64K of memory, at least one disk drive, and, of course, a copy of VisiCalc. It runs on the II, II Plus and the IIfx. Although an 80-column board and a pre-boot routine are not necessary, they are strongly recommended. Without them, it is very difficult to keep track of what you are entering; the titles and the data entered often do not fit on the screen at the same time. The printed output is not affected, but it can make for some clumsy operation.

After loading one of the routines, the cursor appears at the first location for data entry, and VisiCalc is set for manual recalculation. The first time a calculation is performed, the reason it has been set for manual recalculation becomes apparent: some simple looking spreadsheets take upwards of a minute to figure through. This is not a long time in the overall scheme of things, but it is rather long to stare at an unchanging screen.

The package of 18 financial calculators and a well written manual is

\$79.95, which seems to be quite reasonable. Unless you have a very good programmer on your staff who works cheap, it is unlikely that you could develop these routines on your own with any kind of cost effectiveness.

Financial Planning for VisiCalc and the Apple II is manufactured by Howard W. Sams and Company, 4300 W. 62nd St., Indianapolis, IN 46268. ■

Chuck Doherty
So. Dartmouth, MA

Crypto Cube

Did anybody ever like spelling? Write each word 20 times. Write each misspelled word 100 times. Check the dictionary if you're not sure. Check the dictionary, anyway! No wonder kids hate spelling! Crypto Cube is a game that requires some idea of how to spell your words but doesn't scold you for ignorance.

The Wuzzle, a cute kind of head with feet, tells you how to play the game. First, it demonstrates a sample cube, of which you see the front face. Hidden behind the squares on four sides of the cube are several words in crossword-style. Using the arrows on a IIfx (or the control I-J-K-M on a II Plus) you choose a square to look at. If the square conceals a vowel, the letter is revealed, you get five points and your turn continues. If a consonant is hidden behind the square the Wuzzle marches out and tells you to guess a letter. A correct guess gets you ten points and another turn. A wrong answer costs you five points and your turn, if you are playing against a friend. If there is no letter in the square, your turn is over.

Every now and then the Wuzzle will give you a bonus: an extra square on the side you're working on and one square on the next side. This means that when you decide to move on to the next side you may very well find a couple of letters already revealed.

The word list itself is available to you at any time *except* when you have a letter to guess! Thus, with a

letter or two already in place, you can easily check which words they might go to and how to spell any words you might not remember.

Fifty different lists on various topics are provided on the master disk, each list having 20 words. In addition, you can make up your own word lists and save them on another disk. The same words may be used for more than one game, with the computer being asked to make a new puzzle so that the words will be arranged differently.

I played a game with Adrian, my 11-year-old, and made the mistake of being easy with him at first. As soon as he caught on to the game, he raced way ahead! Later that day I found him playing it with a friend who was likewise fascinated.

I later made up a puzzle with Darrel, age 6. He chose the option of a silent game and reversing the colors (white on black instead of black on white). The game definitely moved faster without the sound and we kept his puzzle to shorter words. Darrel tended to jump to conclusions too quickly in guessing the word he was uncovering. We completed two sides, but by that point he had lost interest. If he were a bit older—the suggested age range is eight to adult—I feel the game would have held his interest longer.

The Wuzzle is cute, but he does slow things down. His every move is accompanied by sound (hence the faster game without sound) and when a side is completed he treats you to a little song and dance, after which all the empty squares are filled in. Again, this is a time waster because you can't turn the cube until it is finished.

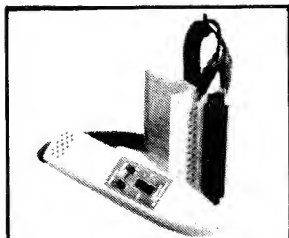
The lengthy dance and fill-in procedure naturally leads to speculation as to what happens when the game is over. The answer is, almost nothing. When the dance is over for the last completed side a square appears in the middle of the screen saying "Game Over," and you are back to choosing options for another game... quite a let-down! From an educational standpoint, nothing else is needed since the goal of the game is

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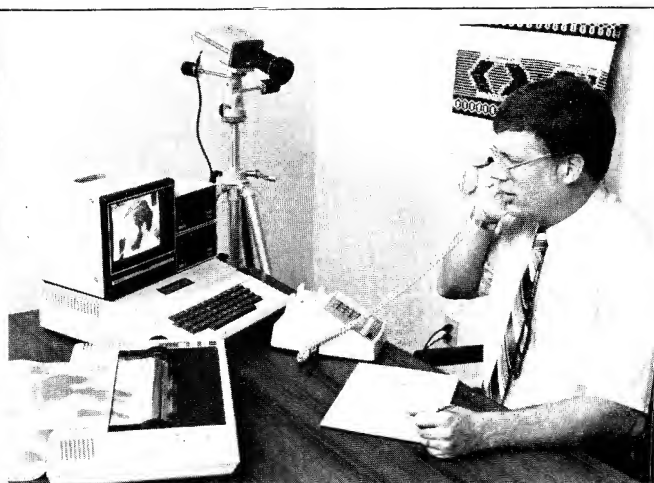


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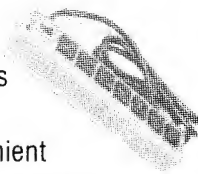
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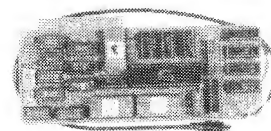
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spelling/vocabulary drill. Then too, any emphasis on winning includes the corollary that the other player is a loser. Still, I would rather see a happy Wuzzle proclaiming "You did it!" than a dull "Game Over" notice!

All in all, Crypto Cube is a game that deserves a place in the classroom, while for the home it will appeal to the word-puzzler. The game costs \$39.95 and is available from Designware, 185 Berry St., Building 3, Suite 158, San Francisco, CA 94107. ■

Tobi Hoffman
Ashland, MA

Arcademic Skill Builders in Language Arts

Arcademic Skill Builders in Language Arts is an entertaining educational package for primary students.

It includes six arcade game learning disks (thus, "Arcademic") and supplementary teaching materials. The program helps students become proficient in spelling, identifying parts of speech, subject-verb agreement, identifying antonyms, homonyms and synonyms, consonant and vowel patterns and sight word vocabulary.

Word Invasion is a variation of Space Invaders where you shoot down words instead of aliens. Your weapon is an octopus with a magic ring that can be shifted from arm to arm. Beneath the octopus is one of the six major parts of speech—noun, pronoun, verb, adjective, adverb and preposition. From the top of the screen the invading words descend. You must maneuver the magic ring (left and right arrow keys) to position it so that you fire (space bar) on the word that is the appropriate part of speech.

Verb Viper is a fast paced subject-verb agreement game. The viper is a friendly creature that feeds on verbs. But he's finicky and only consumes verbs that agree with the subject appearing on the screen below him. As

a stream of verbs approaches his mouth, you must decide if each verb form is correct. If it is, tap the space bar and it becomes a tasty morsel for the creature. But try to feed him too many incorrect verbs or miss feeding him the correct verbs and the game ends.

Word Master teaches children to identify words that are synonyms, antonyms and homonyms. In the center of the screen there is a word; there are eight words around the screen to choose from. You locate the match with your sighting scope and fire on it to score a hit. You must score eight hits before rays emanating from the words strike your word scope. The kind of match to be made (synonym, antonym, homonym) is listed at the bottom of the screen.

Wordman displays a consonant that moves around a railroad track maze. When it passes a group of letters, you must decide if those letters, if placed after the consonant, form a word. If they make a word, press the space bar; if not, do nothing. The moving letter changes often and, as with all the games in this series, hits and misses are recorded.

Spelling Wiz features a wizard who uses a magic wand to zap missing letters into a word. You must decide which of the four choices of missing letters is appropriate, point the wand at that choice and fire. The trick is to do all this before magic bubbles from a boiling cauldron knock the wand from the wizard's hand.

Word Radar gives you practice with sight word vocabulary. You are a control tower operator scanning words. The sight words are disclosed briefly and then covered by white rectangles. A radar beam sweeps across the screen and you must match each sight word that appears at the bottom of the screen before the beam completes its arc.

My children (ages 10 and 7) preferred Word Invasion, Verb Viper and Word Master. By typing Control-P you can to enter an Edit mode to change the speed and difficulty of the games to suit the needs of both children. It is also possible to

eliminate the sound effects for, say, a quiet classroom setting.

I found it disconcerting to try to select the missing letters of Spelling Wiz from four choices. As time ran out, the different letter combinations became more confusing. I'd have preferred to just type in the correct letters. I enjoyed Wordman and Word Radar but was not totally convinced of their educational value.

The supplementary materials include six user's manuals and an array of worksheets for practice and for charting pupil progress.

This program is a simple-to-use and enjoyable educational tool. It is available from Developmental Learning Materials, One DLM Park, Allen, TX 75002. The price is \$44. ■

Mario Pagnoni
Methuen, MA

Microscopic Journey

Who can ever forget the movie "Fantastic Voyage"? Miniaturized scientists guided their miniaturized ship through the body of an unconscious VIP in order to find and destroy a lethal blood clot in the victim's brain. Well, if you liked the movie, you'll like Microscopic Journey—a new game from Hayden Software.

To play Microscopic Journey you will need an Apple II or Apple II Plus, one disk drive, a color monitor and a game paddle. I used an Apple joystick, with the stick controlling up and down movement and the button controlling speed and the laser; this double function of the button (motion of the boat and laser firing) makes the game very difficult for younger children.

I tried using a green screen monitor, but the patterns produced instead of colors made the game difficult to follow and hard on the eyes.

The game is divided into five sections. For the first section the player manipulates a boat through a series of blood vessels. You try not to hit the vessel wall and to avoid floating white blood cells that can dissolve

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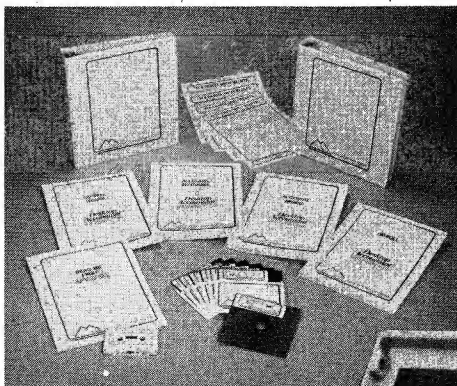
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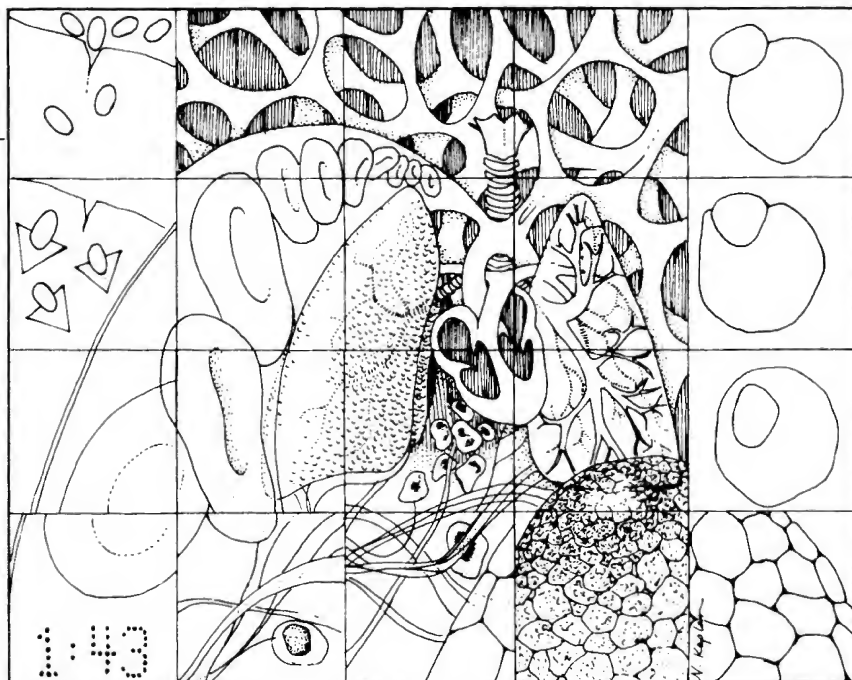


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the ship. You can destroy these leucocytes with the laser or, if you're hit, leave the blood vessel for repairs. Your ship is slowed down as antibodies attach themselves to the ship. Time is a factor in this game, and you must accomplish each section of the adventure without delay. The time remaining appears at the bottom of the screen.

After successfully navigating the blood vessels, you enter the heart and must pass through a series of four valves. While the paddle control is still used, your ship no longer drifts backward when the button is released. Instead, it remains in place or is moved forward when you press the button. If the ship hits one of the valves, the mission is aborted, and if you are hit by a leucocyte or bump into a vessel wall, you are sent back to the first valve-entry point. When you have passed through all four valves you will receive a survival score. At this point you can SAVE the first section of the game; this way, if your mission fails later in the game, you will begin from this point, instead of returning to the beginning of the game.

In the next two sections, movement of the ship is controlled by the computer keyboard. This change is challenging even for experienced players. To pass through the tangled

fibers of the connective tissue, you use the left-right arrows to rotate the ship and the space bar for forward motion. The laser can cut the fibers but it also forces your ship backwards with each use. If you are caught in the connective tissue fibers, your ship tumbles to free itself, using up time. The leucocytes are still present and must be avoided or destroyed. If you enter the blood vessel—your goal in this section of the game—you can move to the lungs, your next objective.

In the lungs you must slice off blobs of tar without destroying the lung wall. After slicing them off you must then ram them with the ship to destroy them. If either the blobs or the ship hit the wall, they destroy part of it. If you go through a hole accidentally, this section of the game ends. You must also cope with the up and down motion caused by the patient's breathing.

The final section, Tumors, remains under keyboard control. You must destroy the tumor, and while you can use your laser to incinerate parts of it, ramming it with the ship works better. You must disintegrate the nucleus of the tumor or it keeps on growing. The nucleus moves about, sometimes jutting out from one side of the tumor mass. The leucocytes are still present, and destroying them now requires more than one

laser blast. Time is still a factor, too. At the end of this section, your final score is displayed on the screen.

Although the science fiction aspects of the game are loosely based on human anatomy, the sketchy descriptions included in the eight-page manual are misleading, especially when coupled with the explanations of the game's objectives. Contrary to the advertisement for the game, it is not an education, but it is an excellent and challenging game.

Microscopic Journey is written by Dan Sullivan and published by Hayden Software, 50 Essex St., Rochelle Park, NJ 07662. The suggested retail price is \$34.95. ■

Janet Meizel
Davis, CA

PeachCalc

It's hard to examine a spreadsheet program without constantly thinking about VisiCalc. I'll try not to here, as PeachCalc is a significant program in its own right. The program has a couple of odd little quirks, but none detract from the fact that this spreadsheet is *good*.

Peachtree Software designed PeachCalc's 176-page, indexed manual with the beginner in mind. But I didn't care for the opening part.

You see, if you read the fine print of Peachtree's Limited Use License Agreement, you discover that you've bought just the right to use PeachCalc. In fact, the cover sheet notes: "This documentation and the software herein are the property of Peachtree Software Incorporated and are loaned to the user under the terms of a Limited Use License Agreement." And: "This material must be returned... on demand."

Actually, CP/M software seems to come neatly packaged with all sorts of forms to fill out and return and agreements to sign. I guess everyone just accepts it and sends all those things back. You do, don't you? And in fact, unless you plan to pass along copies of PeachCalc to someone, they really won't take it away from you.

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Software Reviews

This fancy rental plan is just like buying.

The manual is divided into four tabbed sections: General Information, Self Instruction, Reference Guide and Appendices. There's a useful table of contents and a vinyl quick reference card.

The introductory section presents an overview of the system, and notes you have a worksheet 63 columns wide and 254 rows deep. One thing you'll notice right away is the Help function (which you can access at any time by pressing the ? key). This function calls up various Help screens. It's a good idea.

The manual also notes PeachCalc's ability to protect blocks of information. The only way to access this data is to "unprotect" it. This is terrific for the person who might want to design templates and then have a less experienced person enter the information.

There are 12 lessons in the introductory section. Since PeachCalc is designed to work on about any CP/M system, you have the use of an 80-column display. But because the program can be run on different computers, the display varies with each one. Your active block—depending on the computer you have—may be shown in inverse video, with an underscore, or with the symbols < >. Well, with Apple you get < >.

Unfortunately, the information in the active block is obscured by the brackets. This isn't really serious, as long as the user is aware of it and doesn't misread an entry. The brackets (< >) only show in the active block, of course. And you do see a lot of data. With column widths set initially at 9 characters, you get 8 columns across, with 20 rows deep.

You can manually adjust the width of any or all columns up to 127 characters long. This is really good for titles and other textual information, and many users will set column A much wider than the other columns, as it's often used for text. You don't have to be working in a column to change its width either. You simply indicate which column you want to adjust.

You can actually format a column to a zero width. Widths of 0 to 2 do not display the column name (A, B, C and so on), but will accept data. With the width set at 1, you won't see anything. If the width is 2, you'll see one character of the information. A width of 3 or larger will display the column name and as much information as it can. And the program automatically spills text over into the next column, if it's not in use. So if you had your column widths set at 9, for instance, and wanted SALES BY DIVISION in row 1, SALES BY D will fill the first column and IVISION will fill the next.

PeachCalc lets you move around the screen and worksheet quickly. You can go to any block with the = command (=A5 takes you to A5). You also can use the arrow keys to move up and down and side to side. A little marker at the bottom of your screen shows you which direction you're going. PeachCalc does not buzz at you when you hit the edge of the screen.

You enter numbers as they are. Text has to be preceded with a double quotation mark ("). If you just enter SALES, PeachCalc responds with Formula Error. It must go in as "SALES. This leading quotation mark does not display; it just informs PeachCalc that you're entering text. Formulas can be entered directly (B4 * C15), rather than as (+B4 * C15).

You clear the screen with the ZAP command; you're asked to verify your intentions. You must verify before the program will overwrite an existing disk file. In fact, the error handling is excellent. I could not get the program to crash or lose data.

The manual, as noted, is for the beginner. It could go just a bit farther in its initial explanations. Too often, all details of a command are not explained in the self-instruction section. Information on all the commands is there later on in the reference guide, but I was left wondering about this or that until I finally found it further on.

PeachCalc includes math functions like TANGENT, NPV (net present value), PI, SQRT (square root) and others, but they are not explained fully.

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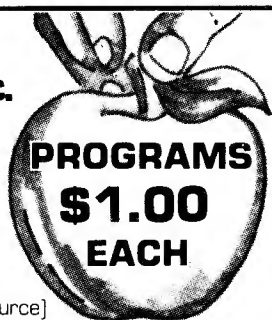
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ly. They're not in the index. The program can use the conditionals AND, IF, OR and NOT; IF comes with a brief example and the others are on the quick reference card but aren't listed in the index. LOOKUP has a limited example. Functions like AVERAGE, SUM, COUNT, MIN and MAX have short paragraphs about them, but aren't in the index, either.

PeachCalc is powerful. You can move rows or columns. You can copy them too. COPY, by the way, won't reproduce blank spaces. However, the BLANK function will blank out either a single entry or a range of blocks.

You can repeat values or formulas over columns or rows, just like you can replicate them in that other program we're not going to mention. You can have titles and windows and split screens and scrolling and simple *** graphs. There is good advice on the formula to use to scale an asterisk graph properly, no matter how large its numbers are.

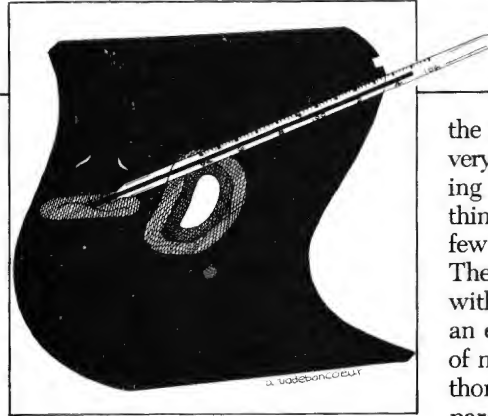
You decide if you want manual or automatic recalculation. You format your entries. You can insert rows or columns (and delete them, too), and you can overlay worksheets. All this and you can protect areas, too.

The 18 available commands are mnemonic—/E means you want to edit; /P means you want to protect an entry; /O tells PeachCalc you wish to output something and so on.

You can load or save all or part of your worksheet. And PeachCalc is not copy protected. In fact, one of the first things you're told to do is to make a copy of the program on a disk with CP/M on it.

You do need to have a program disk on-line, as PeachCalc loads from the disk every time you change functions. /B means you want to blank something out, so the disk whirs briefly. Then you can blank as much as you want. When you want to, say, format an entry, /F lets you do so, with another quick disk access. Basically, any change in function requires a moment of disk time.

The information you see—besides having a lot of columns available for display—is very good. You see how



much memory you have available, which direction you last moved, the active block location, the format, the protection and the contents of the active block.

You can print any or all of the sheet, of course, with the interesting option to print to the screen, which gives you the chance to see your report before you waste any paper. In sum, the program is powerful, works well, and won't crash on you or lose information.

PeachCalc is manufactured by Peachtree Software Inc., 3445 Peachtree Road NE, Atlanta, GA 30326. Price is \$395. It is part of Peachtree's middle-market Peachpak 4 package. ■

Greg Glau
Prescott, AZ

Home Health Disk

The Home Health Disk package provides information on specific medical problems, medical emergencies and how to save money on medical costs. Its two menu-driven disks may be run on an Apple II or Apple IIe, one disk drive and monitor. The publisher warns that with the Apple IIe, Y or N answers to questions must be capitalized for the program to run properly.

Home Health Disk is a series of printed pages displayed on the monitor of your computer. These pages contain information on various medical topics. The author, Dr. Charles Buckley Jr., expresses many personal opinions throughout. For example,

the section on cigarette smoking is a very convincing polemic against smoking and contains, among other things, a vivid description of the last few years of life with emphysema. There is a separate section dealing with the benefits of meditation, and an essay about the varying usefulness of medications. In this section the author states, "Almost all diarrhea preparations except Pepto Bismol are ineffective, as are decongestants." Predictably, some of the statements are open to debate.

The disks themselves run well, if slowly. As per the publisher's notes, you must sometimes press return twice to view another screen. The program's text screens are often difficult to read. Lines of text are very close to one another and where words were removed there are holes. The spacing and grammatical errors could be eliminated by careful editing of the next edition.

When the first disk is booted, the user is asked if this is an emergency situation. The Yes answer brings a list of emergencies that require an ambulance. There is also a Relative Emergency list that covers situations where a physician should be seen, but an ambulance need not be called. You can then call up the specific situation to get more information. Under the Poison heading, along with the information on what to tell the poison control center advisor, there is a space where the number of the nearest poison control center can be entered. This is vital if you plan to use the Home Health Disk in an actual emergency.

Numerous medical topics are discussed, some more thoroughly than others. A large menu gives you the choice of topics. You must view all three pages of the menu before entering your choice. Then a small section of the menu is shown from which you choose again.

The booklet that comes with the disks contains the menus from disk #1, instructions for use, a bibliography and statements of the policies of Brahman Software.

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dissatisfied the disks may be returned for a full refund for three weeks after the purchase date. The company will replace defective disks at no charge for one month and provide back-up disks for a charge of \$10.

While Dr. Buckley acknowledges that 80% of medical information will not change during a one- or two-year period, he nonetheless feels that the ability to provide a current source of information that can be updated easily may make the disk presentation a worthwhile purchase.

Home Health Disk is available from RAM Resources Inc., 100 Lynn St., Peabody, MA 01960. ■

Janet Meizel
Davis, CA

Editor's Note: According to the manufacturer, the latest version of the program is called Personal Health. It is written in Pascal and is priced at \$49.

Peachtree's Accounts Payable

If you're like the normal businessperson, anything that has to do with accounts payable probably makes you queasy.

Well, Peachtree's A/Pay system can't pay your bills for you, but it does provide excellent internal controls along with helpful functions that let you "automate" what you owe.

To use Peachtree's Accounts Payable system, you must have 64K RAM, two disk drives and a Microsoft Softcard. Place a CP/M disk in drive A (drive 1) of your Apple and turn your Apple on. Once you see the A> prompt, type MBASIC to load it into memory. Then type RUN AP MENU to activate the system.

When you buy something on credit, you receive an invoice for the product(s). Peachtree calls these vendor invoices "vouchers." You enter each voucher's data into your accounts payable system, allowing you to distribute the information. If an invoice (voucher) totals \$119.83, perhaps \$95.00 was the item's cost,

\$15.00 went for crating charges, while \$9.83 represents freight costs.

From your own cost accounting standpoint, you need such a breakdown to see where your dollars are going. You'd do even better with a system that reports the summaries of all transactions to your general ledger. The payable system should also provide printouts that show what you owe, whom, and for how long.

Your vendors might stick you with finance charges if you fall behind, so your payables program should be equipped to add any late charges into the total owed, and also to track them as a separate expense item.

The same holds true for discounts. If a vendor offers you a discount on a purchase, your accounts payable system should calculate the discount, and also advise you when to pay to qualify for the reduced price. This is the heart of an accounts payable system.

How does Peachtree's Accounts Payable system stack up?

The Manual

The 114-page manual (plus appendices) lacks an index, but contains useful information on how a payable system works. A flowchart illustrates how its 14 application programs operate. The system is completely menu-driven, as are the other Peachtree Series 40 packages.

The brief tutorial section lodged in the back of the manual doesn't help much. Apparently, the manual's sample printouts were to match the information on the program's sample data disk. Somehow, they don't. Therefore, you need printouts of the sample disk's data before you can access it. After all, you can't look up

someone's account unless you know their account number.

Since the manual is Version 1.1 and the disk is Version 5.2, perhaps Peachtree goofed. But once you get your actual programming underway, the system and manual coordinate flawlessly.

The date entry area, like the entire package, is completely idiot-proofed. Though you cannot enter an invalid date, you can input any year you'd like, making this package applicable into the 21st century. And, if you turn off the system before you END a particular process, it beeps upon restarting and properly closes the files.

You have room for approximately 900 "spots" on your data disk; each vendor file requires two spots. Thus, if you have 100 vendors, you're allowed about 700 transactions during a month. If you have 250 vendors, you can enter only about 400 transactions per month. With luck, that's enough for you.

It's Peachy

Peachtree conveniently provides two extra address lines for suppliers with both a street address and a PO box. Your account number is made up of six alphanumeric characters.

The system also offers complete "auditability." You accomplish this by opting to prevent anyone from deleting a transaction. Then, when you make a mistake, you enter a reverse entry to cancel the incorrect amounts, and re-enter the transaction with the correct figures. That way, your accountant can follow each transaction all the way through. He'll love it.

If you prefer, tell Peachtree's Accounts Payable system to let you delete transactions, just as you'd erase entries from your manual journals. However, this—as you might expect—can cause all kinds of imbalances within your books. In either case, the choice is yours.

Each vendor account includes fields for quantities bought annually from suppliers, and amounts paid to them. The program also indicates the number, date and amount of the last

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check you sent each vendor. If any balance remains in a vendor account, you cannot delete that account.

You can mark vendors as "auto entry" accounts, programming the system to create and automatically post invoices each month, per your instructions. This feature is ideal for bank loans, rent, and any regular payments.

For regular transactions you can distribute each invoice's details among up to eight accounts (materials, freight, permits, office supplies, legal, accounting, and so on). With automatic entry accounts, you are limited to two breakdowns. However, for automatic entry files such as rent or loans, this should suffice.

You enter transactions as a batch, up to 99 at a time; they are posted automatically. Peachtree's Accounts Payable system double-checks your entries properly, but it doesn't double-check any account numbers that will receive this information. A general ledger system, of course, won't accept any numbers for which it does not have an account. But if you let the Accounts Payable package stand alone, you can input any five-digit account number you like.

Pros and Cons

The program's reports and printouts are at the same time its weakest and strongest features. On the plus side, the system prints aged receivable reports for you, and you choose the date on which the aging will occur. It also prints a unique cash requirement report that lets you know exactly how much cash you need to pay the bills you select, and even incorporates discounts.

When you select which invoices to pay, you can instruct the system to pay those due on a due date, or individually. If you ask to pay all invoices due immediately, the system indicates how much cash you need. You can then delete or add invoices, depending upon your cash supply.

It's difficult to trick this program. I entered a large credit into an ac-

count, giving that vendor a credit balance, and then told the system to print a check to that supplier. It would not, although it did print a check "register" to show why the check wasn't printed.

If an account has an open credit, the program automatically deducts it from any check you write to that vendor. That ensures you don't forget to deduct the credit from a payment.

But not everything is perfect. The checks come with their information stub on top. While they look nice, you can't run them through a check-writer unless you tear off the stub. That defeats the whole purpose.

The system prints up to 12 invoices on a check. Many vendors have more than 12 invoices in the system, but Peachtree's Accounts Payable allows only one check per vendor (per print run). So, if you have a vendor to whom you owe 32 invoices, this program lists the first 12 on one check, writes VOID on the check, lists the next 12 invoices on the next check, writes VOID on it, and eventually reaches the last check, which shows the final amount.

While this is one way to handle more invoices than will fit on a check, it's rather unusual.

This program numbers checks for you, but that's more trouble than it's worth. For instance, if you want to use the same checks for payroll, you *must* buy a payroll program that also numbers your checks as it prints them.

You always must keep track of your check numbers. If you write checks for miscellaneous items, and if you want to have only one supply of checks, you'll have to hand-number them all.

And if you write a check by hand to pay a voucher already entered into the Accounts Payable system, you've got problems. You cannot go back and just enter the data from that hand-written check. Since this package is designed to write *all* payable checks for you, you're better off to let it. For miscellaneous expenses, you can either let the system write its own check and then void it out, or re-enter the voucher as paid. There should be

a simpler way.

Your printer must be in slot 1 inside your Apple, and there's no way to send the printer control codes. Since this package requires a 132-column printer, you'll likely have to instruct yours to print in compressed characters, so they'll all fit on the page. Table 1 lists the procedure to produce proper printouts with an Epson MX-80 F/T and Peachtree's Accounts Payable program.

Conclusion

Aside from minor difficulties with check-printing and the inherent distaste for accounts payable in general, the businessperson will enjoy this package. It truly automates your payables; it lets you know exactly what you owe to whom and for how long. It creates checks for your purchases. And though I don't care for the style of these checks, you may like them.

At \$400 it's not cheap. But Peachtree's Accounts Payable program does just about everything you desire. It's available from Peachtree Software Inc., 3445 Peachtree Road N.E., Atlanta, GA 30326. ■

Greg Glau
Prescott, AZ

Peachtree's Accounts Receivable

In the old days, an accounts receivable clerk wore a green eyeshade, thick glasses, and carried around a big black ledger. Today he works without this paraphernalia (except perhaps the glasses), and sits peering at a monitor extracting summaries, reports, statements and invoices from a microcomputer using an accounts receivable program.

Such a program should inform the business owner "who owes what." How much do they owe you? For how long? Have you sent an invoice? Statement?

Secondly, a system should provide for your accountant a breakdown of the quantities you've sold, for how

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7. Credits. Rather than a cash receipt, you *credit* a customer's account.
8. Returned items.
9. Discounts allowed.
10. Miscellaneous credits.
11. Accounts receivable. The manual explains this as the "account numbers to which all debit and credit amounts will report for any receivables transactions."

Table 1. These are the 11 fields requiring information for posting to the general ledger.

much and so on.

Peachtree's Accounts Receivable program wants to be a full-blown accounting system. While it has its advantages, it also presents problems.

The 108-page tabbed manual begins with a flowchart explaining how the 13 application programs interact. Curiously, the manual banishes its tutorial section to the back, rather than placing it up front where it belongs. Also, there is no index.

You should work from copies of

the two program disks and sample data disk provided with the system. Unlike other Peachtree software, you won't have to add CP/M and MBasic onto your disks. Instead, boot CP/M to start, type MBasic to load it, and then load the program. This means you'll need the Microsoft Softcard, rather than anyone else's Z-80 card, since Peachtree's Accounts Receivable program is written in MBasic.

Somehow, the reports on the sample data disk don't match the

manual's printouts, so the people you read about don't exist on disk. Thus, you need a printout of the sample data disk before you can use it for practice.

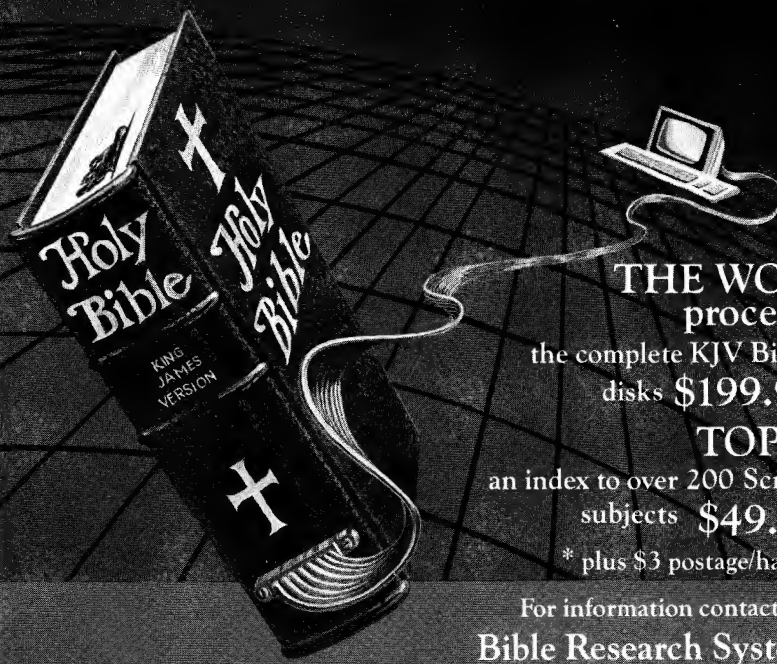
A system set-up program creates a blank data disk calling for your account codes so the program can interface with Peachtree's general ledger system. This convenience saves much posting time; once you've entered the information into your accounts receivable file, you can update your general ledger with a few keystrokes. Before you start, make sure the account codes in the accounts receivable and general ledger systems match up.

The system provides 11 separate accounting codes for distributing sales and income (see Table 1). For many businesses this is plenty—for others, not nearly enough.

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thing you sell into one category, it all gets posted to Sales. No sweat. But what if you sell materials, labor, resale items, contract work, outside services and leasing, and you need to keep track of them all? This system cannot do that for you. It just can't break down your sales sufficiently enough.

There's another problem. Each customer file has a spot for a tax rate. When you create invoices, the program computes the sales tax according to the rate you programmed. That's ideal if all your customers pay sales tax. But some may have resale accounts. Others might be tax-exempt. Some may be government agencies, who don't pay sales tax to themselves.

Also, in many states, labor is non-taxable. If you sell an adding machine you'll add sales tax, but if a year later you *repair* that same

machine, you won't charge tax. More often, customers pay sales tax only on selected kinds of work, according to individual state law.

With the Peachtree Accounts Receivable program, you either must enter a percent into the sales tax field or leave it blank and manually add the tax.

Invoicing

The system's invoicing program allows you a six-digit invoice number. You can enter them manually or just input the first invoice number and the program will increment them. The program performs automatic extensions for you, too. If you sell 22 of an item at \$10 each, the program totals them at \$220.00. And of course, the amount of the invoice automatically is posted to the customer and sales or credit accounts.

You can designate individual cus-

tomers as "automatic billing" accounts, meaning you'll send them an invoice for a previously specified amount each month. If you have regular customers, this is a terrific, time-saving feature.

When you print invoices, enter all shipping data including where to send the order, how to ship it, when it will ship, the order date, your order number, their order number and other information.

Evidently, the system's invoicing section is designed mainly for mail order companies. There are 12 fields you must contend with when you create an invoice, so unless you use most or all of them in your business, you'll waste time.

The number of customers and transactions on a disk must add up to about 900. If you have 100 customer accounts, that leaves room for about 800 transactions. If you have 250 cus-

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BSAVE*	13.6 sec.	4.1 sec.
BLOAD*	9.5 sec.	2.6 sec.
READ**	42.2 sec.	12.4 sec.
WRITE**	44.6 sec.	14.9 sec.
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1. Load a normal Apple disk and turn the system on.
2. Turn on your printer (it must be in slot 1 to work with this program).
3. Type PR#1. This initializes the printer. It will respond by moving the paper up a line.
4. Type PRINT CHR\$(15). This is the code your Epson will understand for compressed print. It will print on the paper, but doesn't hurt anything. You must then leave your printer on; if you turn it off it will revert to its default (larger) character size.
5. Insert your CP/M disk and type PR#6 to load CP/M.
6. Type MBASIC to load it into your Apple.
7. Put the Accounts Receivable program disk into drive A (#1) and its data disk into drive B (#2).
8. Type RUN "AR MENU" to start the Accounts Receivable program.

Table 2. This is the sequence required to tell your Epson MX-80 printer to print in the compressed character mode, so 132 characters will fit across your page. This will help you get started with Peachtree's Accounts Receivable program.

tomer accounts, you can have about 650 transactions per month. In any case, you're allowed a maximum of 500 customer accounts per disk.

You cannot move from disk to disk to gather reports. You could have customers' names from A-F on one disk, G-N on the next, and so on, but if one day you have more customers than one disk's worth, you'll have to consolidate all the summary data by hand.

The program has flexible customer information sections. You can designate a customer as a regular account, allowing any unpaid transactions during the current month to be carried forward to the next, or a balance forward account, which moves only the ending balance forward.

You're allotted 24 characters for your customer's name, 24 for their address, and 24 for their city, state, and zip code. Plus, each customer account number is a six-digit alphanumeric code.

The program also has powerful credit functions. You can apply payments to specific invoices as well as consolidate them. That means if you have the same invoice number for both a charge and a credit, you can instruct the program to "wash out" both transactions to make more room.

There's another problem. Peachtree's Accounts Receivable program was written BFC—Before Finance Charges. You can add interest charges to statements manually, one account at a time, but the system *cannot* scan

all your accounts and add a finance charge to those past due. It's inconceivable that a modern-day accounting system would not have this capability.

Aging Gracefully

You can print two kinds of aging reports. The first contains names and amounts, with the dollars in columns to show how old the accounts are. The other, called "detail aging," gives the basic information and adds all open invoice numbers. In either case, you select the date to start the aging process.

The customer files track items like year to date charges and credits, the last payment date and the amount of the last purchase. Each transaction has a "summary" line to indicate what the invoice is for.

The program prints all customer accounts alphabetically. You can print up to 75-word messages on your statement to all customers, all automatic billing customers, or just one individual account. The system, though, even prints statements for accounts with a credit balance.

The system allows you to delete transactions, but doing so will foul up audits. It's better from an accounting standpoint to enter a reverse transaction (cancelling the first one), and then to input the correct amount(s). This program will *not* allow deletions for any transaction already posted to the general ledger.

For system reports you need a 132-column printer interfaced to Slot 1

inside your Apple. We tried the system with a Centronics 779, and after reducing the character size it worked fine. If you have an Epson MX-80 F/T, it must be programmed to print in its compressed character mode. The routine outlined in Table 2 will do the trick.

No matter what kind of printer you own, be sure to use it with the system before you buy.

Number Please

The Peachtree allots a field for a phone number, but you must enter it without any dashes (6024453212). While the system eventually aligns it for you (602-445-3212), the Customer Maintenance selection still displays it as 6024453212.

Also, when you look at an account through the Display Customer Status program selection, part of the name and number run together. Here's an example:

ALLEN & COMPANY (404)255-99994436
ROSWELL RD. NE.

Warning: Don't press reset! If you do, turn off your Apple and restart with your CP/M disk in Drive 1.

Once a particular function is complete, the program insists that you press return to prompt the main menu, rather than going there itself.

These aren't major problems, but they affirm that an update would improve the program.

Peachtree's Accounts Receivable program could perform well for your business. You must have the particular hardware (64K, Microsoft Softcard, 132-column printer, two disk drives) to run the system. Remember, this accounts receivable program can interface with a general ledger system, saving data-entry time while always posting things properly. (Peachtree's General Ledger, by the way, is top-notch.) In short, this program is worthwhile if you have the hardware and can cope with its limitations. It's available for \$400 from Peachtree Software, 3445 Peachtree Road N.E., Atlanta, GA 30326. ■

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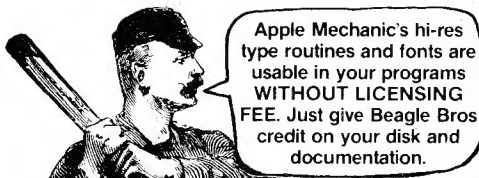
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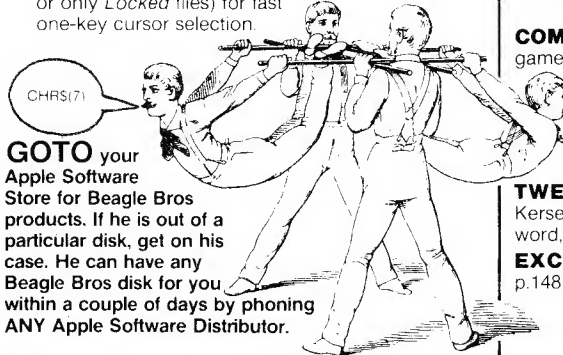
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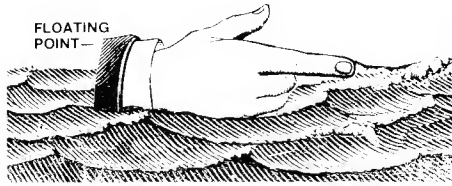
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by MARK SIMONSEN

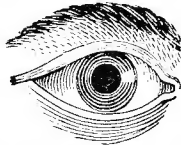
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POKE 233,3: DATA 1,0,4,0,5,0
2 HGR2: FOR R=0 TO 192: ROT=R:
SCALE 96: XDRAW 1 AT 140,95:
SCALE 30: XDRAW 1 AT 140,95:
S-PEEK(49200): NEXT: RUN

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SAVE 60-SECTOR PROGRAM	24 sec.	9 sec.
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Book Reviews

The Survival Kit for Apple Computer Games

by Ray Spangenburg and Diane Moser

Wadsworth Electronic Publishing Co.
10 Davis Drive
Belmont, CA 94002

Softcover, \$9.95

If you have a library of classic (or at least old) Apple games but can't get past the first screen of any, you might find *The Survival Kit for Apple Computer Games* a help, if you can overcome two reservations. The first is the inescapable feeling that this is simply another cash-in/rip-off book like the *Thrashing Pac-Man* paperbacks of a few years ago. The second is the authors' occasionally fatal case of the cutes.

For those hopelessly stuck in Zork I or misled by Microwave's documentation (Teddy the Salvage Man need not avoid the beams that fry aliens), the *Survival Kit* fulfills its small mission. Spangenburg and Moser give brief tours of 24 adventure, arcade, fantasy and strategy games, mentioning system requirements—II or II+; the IIe, like many popular games, was too new to be included—as well as publisher's address, price (buried in an appendix) and whether the game needs color or is okay in black-and-white.

In addition, each game gets a "prologue," a winsome, ad-like narrative description, followed by a "reconnaissance report" from the authors and "advice from the vets"—veteran players, not veterinarians.

Spangenburg and Moser are effervescently enthusiastic at offering tips for dodging Sneakers, and their adventure hints are helpful if unsubtle ("Think of Horace Greeley [here]"). They seem less at ease advising Sargon II chess players ("Concentrate ... Think ahead ... Hemingway described courage as 'grace under pressure'").

The book's worst fault, though, is its choice of games. While the au-

thors say they "tried to include some of the hottest new entries on the market and some of the classics," you won't find Choplifter or Aztec, let alone newer hits. Instead, there are comparative antiques like Jawbreaker, The Wizard and the Princess, and Crush, Crumble, and Chomp!

Rating their 24 games on a four-point scale, the authors gave only Deadline and Wizardry 4's and Snake Byte and Cross Fire 3.5's. By contrast, 11 programs rated only 2 or 1.5. If Spangenburg and Moser, for all their bubbly prose, can't get excited about half the games they played, it's hard to get excited about their book. ■

Eric Grevstad
Peterborough, NH

The Complete Handbook of Personal Computer Communications: Everything You Need to Go Online with the World

by Alfred Glossbrenner

St. Martin's Press
175 Fifth Ave.
New York, NY 10010

Softcover, \$14.95

If there's a modem in your future, you'll want to be sure to read this new book. Even if you've already logged many hours on The Source or CompuServe, you may not be aware of all the other information that you might be able to use. In any event, *The Complete Handbook of Personal Computer Communications* is the first book that details just about everything available and how to get it.

The author begins with a two-chapter overview of the subject. He briefly sketches each kind of database, then tells what hardware and software you'll need. He gives specific facts as well as alternatives. (Note: *I would have found the chapter on using Telenet and Tymnet [the systems that allow you to use local phone numbers instead of long distance ones to access a database] more*

useful here than in the Appendix.) Next, he describes each of the major information utilities and databases—The Source, CompuServe, Dow Jones News/Retrieval Service, etc.—in great detail by devoting an entire chapter to each one.

All chapters are liberally sprinkled with boxed-off *Online Tips*. Each tip contains some bit of information that isn't crucial for your understanding, but handy to know. Each chapter is loaded with incredible amounts of information, from addresses and phone numbers to sessions on moving around the particular utility. For example, I accessed The Source without either its manual (I was using a friend's access codes) or the manual for the transmittal software. I easily found and printed out a list of all the flights from Chicago to Tampa Bay. Frankly, I'd never even used our modem before that.

Now, Mr. Glossbrenner doesn't stop with the major databases. He also includes chapters on Computer Bulletin Board Systems; Electronic Shopping, Banking, and Barter; Computerized Conferencing; and what he calls "telecommuting"—that is, working at home and sending your work to an employer via telephone lines. He finishes with a chapter on technical information. His appendices include a troubleshooting checklist, sending Mailgrams or a Telex, and such esoteric topics as using your desktop computer as a typesetter. He even puts the most important commands for the three major information utilities in a Quick Reference Command appendix. And there's also a very good index.

Unfortunately, you'll have to pay a price to get to all the information you need. Most of the sentences are badly overwritten and the writing style is condescending sometimes and downright cutesy-pie at others. It would have benefited from judicious editing, especially the excessive number of quotation marks.

But that's my only criticism. There's an abundance of useful facts and suggestions. For instance, Mr. Glossbrenner's tips on buying subscriptions to one or more of these ser-

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Ann Baldridge
Bloomington, IL

Pascal Programs for Business

by Tom Swan

Hayden Book Company Inc.
Rochelle Park, NJ

Softcover, \$15.95 or \$49.95 with disks

Here is a good book for intermediate Apple or UCSD Pascal users who are looking for more long and useful Pascal programs they can learn from and adapt. This book has 28 programs, as well as an all-purpose unit you can stuff in your system library.

About half the programs pertain to word processing. The program Columns is one you are likely to need, because the usual Pascal screen editor cannot make a text file print out in more than one column. Swan also gives a text formatter program which improves in some areas on the public domain ones.

The remainder of the instructive programs are of a general business nature, including some simple statistics and charting, financial analysis and an elementary spreadsheet.

Swan is evidently a professional programmer who uses these Pascal programs in his own work. They seem well tested and the program listings are printed right from the original text files, so you should have no trouble getting the programs to compile after you spend hours typing them in. I found only one misprint, a missing single quote on page 76 before the word "calculate."

For those who don't want to type in the programs, disks are available with

the book. If you do type the programs in, it may be some consolation to think that all that typing and debugging is necessary to figure out how Apple Pascal programs really work. One of the virtues of Pascal is that you can pull procedures out of one program and use them in another, or easily modify parts after debugging.

If you're a beginner, you need additional instruction on how to "include" files with the original Apple II Pascal 1.1 (better to say, Apple Language System) editor. (See page 63 of the *Apple Pascal Language Reference Manual* for more details if you have difficulties.) When using the original editor, you can eliminate the underline characters Swan uses for readability, and replace the curly brackets with asterisks inside parentheses. But if you do have the facility for entering and displaying the curly brackets, you can use them to comment out a section of the program (including any comments inside the other comment characters) you don't want compiled.

I would not recommend you try to save space by leaving out the comments Swan provides. They are useful and appropriate and do not take up any space in the compiled program.

The unit xtrastuff is the best part of the book. There are procedures for inputting to prompts and editing responses which are really elegant. Every Pascal programmer needs something like this. In chapter 4, Swan also explains the procedures in the unit and how to modify them. Unfortunately, the unit is exactly duplicated in Swan's twin book, *Pascal Programs for Games and Graphics*.

Chapter 3 gives a reference guide to some UCSD Pascal extensions. If you are planning to use this book with a version of Pascal such as Microsoft's IBM-PC or MT+, you will need to do more work since Swan uses many UCSD extensions when they come in handy. These programs should run with no trouble in Apple III Pascal, however.

I had one minor complaint about xtrastuff. The idea of compiling it as a unit and placing it in the system library is in large part to save space on your disk: You can use the same unit for each program that needs the routines it contains. When I installed it in my system library I discovered that it just barely slopped over to a second slot. If it were just a little smaller it would leave some precious room for another unit in the library.

You will have no trouble using these programs without an 80-column card. Apple Pascal allows you to scroll or switch between two 40-column screens side by side. Swan's menus use only the left side.

There are some problems with the honeycalc visiclone program. If you type in the program without making any changes first (as well you should), you will discover there is an arrow to the right of the cell storing the result of a calculation. This is a place marker or reminder, but acts more like a stolen bookmark: The arrow overprints any information already in that cell (just on the screen, as the original is still in memory), and over the row letter in the first column of the next row if you enter a result in the last column on the right. You cannot display formulas—you just point to a cell with your cursor and enter an arithmetic function.

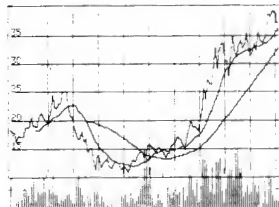
Also, the numbers are not formatted properly. You are allowed only a money format with two decimal places. If you enter a number such as 99000, it will have one zero after the decimal place instead of two, while if you enter 999000, it will have no zeros, and one million will get you 1.00000E6! Hmm.

The sort-text program works pretty fast, but needs more polishing for business use. For example, it sorts lowercase letters to the end of uppercase characters, the same as the ASCII sequence. But usually "von Beethoven" comes before "Westinghouse," not after "Zzygy." Also, numerals must be right-justified in order to be sorted properly, and all the same length, padded with zeros. Otherwise the one digit numbers come before the two digit ones,

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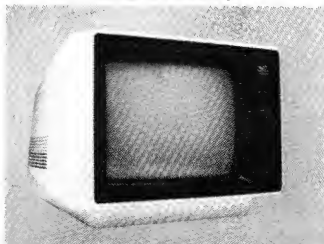
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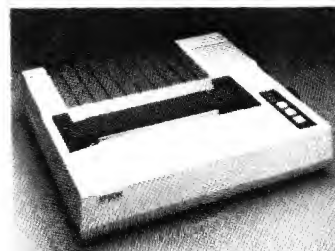
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which come before the three digits ones, etc.

The identifier program works fast too, but also needs more work. The reserved words are capitalized, and the remainder in lowercase, but the indentation is not accurately preserved.

It is difficult to locate programs as there is no index to the book nor list of program names.

After you spend hours typing in these programs you might wonder if you really should be trying to learn Pascal as a programming language. Once you learn Pascal you can learn any other language or computer application easily. Swan's book is an excellent next step after learning the basics. ■

**Eric Eldred
Derry, NH**

The Soul of CP/M

by Mitchell Waite
and Robert Lafore

Howard W. Sams & Co. Inc
4300 West 62nd St.
Indianapolis, IN 46268

Softcover, \$18.95

When Digital Research Corporation introduced the CP/M operating system some years

ago, few people would have guessed the extent of its acceptance in the often-changing field of small computers. By accepting this one standard system, hardware manufacturers provided their users with an enormous selection of applications programs, while software writers could spend more time perfecting their programs and less time adapting them to various systems.

**"If you are not careful you
may even find yourself
learning machine and
assembly language..."**

For all of its flexibility, many users see only the tip of the CP/M iceberg. Most never go beyond simple copy and format functions, leaving the more exotic features of CP/M to those less intimidated by such things.

The Soul of CP/M takes you into the deepest, darkest heart of CP/M, and does it without the confusion (or boredom) common to so many computer tutorials.

Mitchell Waite and Robert Lafore present their information in a light, totally painless fashion, introducing new concepts so smoothly that you feel like you have known them all

along. If you are not careful you may even find yourself learning machine and assembly language after all these years of considering them unfathomable.

Part of this book's unique approach is that it focuses all of its information back onto CP/M; if something new is introduced, you clearly see how this relates to CP/M. Right from the start, the writers have you using CP/M's DDT (Dynamic Debugging Tool) to practice interfacing with Basic, changing sections of CP/M itself, and tackling machine language programming one bite-sized chunk at a time.

While it is certainly not a first-time user's guide, *The Soul of CP/M* is great for anyone familiar enough with CP/M to know the difference between PIP and ASM. It won't be long before you write machine-language subroutines for your Basic programs and mold the operating system to suit *you*, instead of the other way around.

The Soul of CP/M is an outstanding reference work, aside from its obvious benefit as an instructional text. One example: The section dedicated to CP/M's assembler routine provides a much clearer guide to its operation than any provided with the system itself. Appendices are provided for such items as 8080 instructions, BIOS system calls and sample utility programs.

At \$18.95, *The Soul of CP/M* is not a book you buy on a whim, but it is a

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Amdek Color I Monitor	399.00	320.60
Apple Cat 2 Modem	389.00	284.30
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Appli-Card (6 MHz)	375.00	287.50
Banana Printer	249.95	221.55
Bufferboard - 16K Upgrade	28.00	15.00
Bufferboard - 16K	175.00	132.60
Buffered Grappler + (16K)	239.00	178.00
Echo 2 Speech Synthesizer	149.95	125.60
Enhancer II	149.00	113.30
Function Strip	79.00	57.15
Gorilla 12 in Green Scrn	99.00	91.50
Grappler +	165.00	128.00
Koala Graph Tablet-Apple	124.95	91.05
Kraft Joystick	64.95	46.00
Kraft Paddles	49.95	35.35
Micro-Sci A2 Disk Drive	345.00	266.50
Micro-Sci C2 Controller	100.00	81.70
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Mockingboard I	179.00	152.00
NEC 1201 Green Monitor	285.00	166.15
NEC 1212 Color Monitor	399.00	310.00
NEC 1260 Green Monitor	149.95	113.50
NEC PC8023 Printer	599.00	441.85
NEC PC8025 Printer	975.00	825.00
Parallel Card W. Cable	99.00	56.55
PI-2 12 in Green Monitor	210.00	154.55
PI-3 12 in Amber Monitor	249.00	162.00
PI-4 9 in Amber Monitor	199.00	144.50
Plaso Interface	175.00	132.60
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Prowriter 8510 Printer	595.00	500.00
Ramcard 16K (Microsoft)	99.95	75.00
Ramcard - 16K (MPC)	99.00	60.25
Ramcard - 16K (Prometheus)	99.00	56.55
Ramex 128	499.00	366.80
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Softcard Premium System	695.00	500.00
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Wizard-16 (16K Ram)	95.00	62.85

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Bumble Plot	39.95	28.30
CDEX - How to use the IIE	59.95	43.35
Compu-Math/Arith. Skills	49.95	34.50
Compu Spell System	29.95	20.70
Delta Drawing	59.95	43.00
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Early Games	29.95	23.95
Facemaker	34.95	24.85
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Gertrude's Puzzles	44.95	31.85
Gertrude's Secrets	44.95	31.85
Home Accountant	74.95	48.05
How to Pgm in Applesoft	49.95	35.35
Juggles Rainbow	29.95	21.20
Kindercomp	29.95	20.70
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Master Type	39.95	28.30
Meteor Multiplication - Home	29.95	23.95
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Easy Writer (Pro)	175.00	121.00
Format II Enhanced	150.00	108.50
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PIE Writer 2 (40-80)	149.95	106.15
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Screenwriter Professional	199.95	138.25
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The Dictionary	99.95	69.00

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Alpha Plot	\$39.50	\$27.25
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Elephant Disks SS/SD (10)	34.00	21.15
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Trunk Floppy Storage	29.95	21.50
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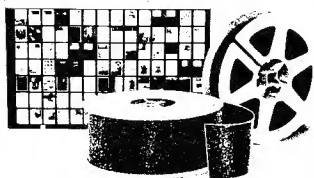
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Book Reviews

great book for any serious system user. There are few books that give this level of information at any price, and when you consider the superb writing style, *The Soul of CPM* is a bargain; I can recommend it with little hesitation. ■

Chuck Doherty
So. Dartmouth, MA

"The book is well written,
and complicated technical
material is clearly
explained."

Hardware Interfacing with the Apple II Plus

by John Uffenbeck

Prentice-Hall Inc.

Box 500

Englewood Cliffs, NJ 07632

Softcover, \$19.95

Are you a computer hacker who has to fight the urge to pop the top on your Apple and poke around inside? Do you delight in building joysticks, installing unique hardware interfaces, replacing ROM chips and connecting cable straps? If you do, then *Hardware Interfacing with the Apple II Plus*, written by John Uffenbeck, is the book for you.

This book was definitely *not* written for individuals just beginning to explore the depths of digital electronic circuitry. The author wrote the book for the hacker who is proficient in Basic programming, digital breadboarding and using the 7400 series of digital logic gates. The book is by nature a workbook. A series of 13 hardware interfacing experiments range from demonstrations of address decoding to constructing a programmable sound generator. Each experiment is well organized and includes: 1) a list of objectives for the experiment; 2) a thorough parts listing; and, 3) a discussion of the theoretical

basis for the experimental procedure. The book is well written, and complicated technical material is clearly explained.

There is a small inconvenience associated with the use of most workbook texts, and this book is no exception. In addition to the book itself, supplementary materials must be purchased before these 13 experiments can be successfully accomplished. If you own a soldering iron and have a "junkbox" of electrical components, then it should cost you less to complete these interfacing experiments than if you start from scratch. However, the *basic* materials needed to accomplish the experiments in Mr. Uffenbeck's book are a soldering iron, pliers, wire cutters, solder and wire. The approximate cost of these basic materials is \$30.

Additionally, the author recommends the acquisition of several optional pieces of electronic equipment: logic probe (\$20-\$35), multimeter (\$10 minimum), wire stripper (\$10) and oscilloscope (megabucks!). Although these optional items are not necessary to complete the experiments, they would be extremely helpful. Mr. Uffenbeck also offers several recommendations for where to purchase the electronic components needed to complete the experiments in his book. The estimated cost of the required parts is \$150.

In summary, the items necessary to successfully complete the 13 interfacing experiments are: the book (\$19.95); the basic materials (\$30); the optional items—less oscilloscope—(\$50); and the electronic components (\$150). Thus, the total estimated cost of the venture is \$249.95. I feel that this cost is relatively small compared to the value of the lessons to be learned from this book, and I heartily recommend the book as a source of information and just plain fun. After all, most of the electronic components are reusable and they will undoubtedly come in handy when you build your first robot. ■

Michael Waugh
Statesboro, GA

READER SERVICE

My vote for the best advertisement in this issue goes to _____ (company) whose Reader Service number is _____.

A. How thoroughly do you read the articles in *inCider*?

- ☐ 1. Read almost all articles thoroughly
☐ 2. Skim almost all articles
☐ 3. Read some thoroughly, skim others
☐ 4. Just use for reference

B. If you were planning to purchase an additional computer would you buy another Apple?

- ☐ 1. Yes
☐ 2. No

C. Do you own a VCR?

- ☐ 1. Yes
☐ 2. No

D. Where do you purchase most of your computer equipment?

- ☐ 1. Computer or electronics store
☐ 2. Department store
☐ 3. Mail order
☐ 4. Direct from manufacturer
☐ 5. Office equipment dealer
☐ 6. Used equipment dealer
☐ 7. From private individuals

E. How much do you plan to spend on software during the next 12 months?

- ☐ 1. Nothing
☐ 2. Less than \$100
☐ 3. \$100-\$250
☐ 4. \$250-\$500
☐ 5. \$500-\$1,000
☐ 6. Over \$1,000

F. Which of the following types of software do you plan to purchase during the next 12 months?

- ☐ 1. Games
☐ 2. Education
☐ 3. Word processing
☐ 4. Spreadsheet
☐ 5. Utility
☐ 6. Home finance
☐ 7. Stock market analysis

G. Which of the following hardware items do you plan to purchase during the next 12 months?

- ☐ 1. Printer
☐ 2. Plotter
☐ 3. Modem
☐ 4. Joystick
☐ 5. Graphics tablet
☐ 6. Synthesizer
☐ 7. 68000 board
☐ 8. Disk drive
☐ 9. Monitor

H. Do you use your Apple for any of the following applications?

- ☐ 1. Business
☐ 2. Word processing
☐ 3. Home/Hobby
☐ 4. Games
☐ 5. Programming
☐ 6. Education
☐ 7. Other

I. If you have children who use computers, how old are they?

- ☐ 1. 5 or under
☐ 2. 6-10
☐ 3. 11-15
☐ 4. 16-18
☐ 5. 19-22

J. If you have school age children, where do they use computers?

- ☐ 1. Home
☐ 2. School
☐ 3. Work
☐ 4. They don't use computer

K. On a scale of 1 (no interest) to 5 (great interest), please rate your interest in the following types of articles:

- ☐ 1. Programming techniques
☐ 2. Reviews
☐ 3. New products
☐ 4. Hardware construction
☐ 5. Application programs
☐ 6. Speech/sound
☐ 7. News
☐ 8. Editorial
☐ 9. Telecommunications

L. If you are not a subscriber please circle 500.

Reader Service: Return this card to receive full information on the products advertised in this issue. Refer to the ad. You will find numbers near the logo of each advertiser. Each represents the advertiser's individual Reader Service number. Circle the corresponding numbers on the card on this page. Include your name, address & zip, and drop in a mailbox. In 4-6 weeks you'll hear from the advertiser directly.

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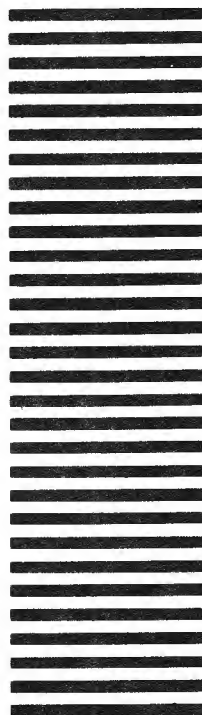
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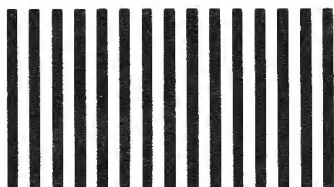
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Keywiz VIP

One of the first problems most users of computers run up against is the fact that the human-to-computer interface is a keyboard. The typewriter keyboard has to be one of the most inhumane devices ever invented.

Then, to make things worse, a language is invented which includes statements like "A5\$ = STR\$(VAL(MID\$(U1\$(4,5), TR%, LEN(U1\$)-2)))". My hands almost hurt after a bout with this kind of typing. There is also some commercial software featuring commands with no obvious connection to the function to be performed. For instance, WordStar uses control codes for all of its commands.

Now to help with all these problems and others comes a product from Creative Computer Peripherals called Keywiz VIP (Very Intelligent Peripheral). It is a keyboard with 31 programmable keys that plugs into Apple II, II Plus or Franklin Ace computers. But not just 31 keys are available. There is a shifted set available by pressing the shift key, making 62 keys available. But wait a minute! You can call up four dif-

ferent keyboards from internal memory for a total of 248 user-programmable function keys.

An LED display tells you which of the four keyboards you are using. A step key allows you to rotate through the different keyboards. A shift-lock key is used to lock in the shifted set; again, an LED indicates whether you are using the shifted or unshifted set.

The major difference from other external keyboards is that the Keywiz VIP is user-programmable. You can designate a program key to be any eight keystrokes on the Apple keyboard. The programmed functions keys never forget. The Keywiz uses an EEPROM (Electrically Erasable Programmable Read Only Memory) to store what you put in it. When you turn the power off you do not lose anything.

Installation takes about ten minutes. There is a small calculator-style power supply that plugs into a wall socket to provide power for the Keywiz. Keywiz requires no software and no memory space in the computer. The unit has its own microprocessor and software to take care of everything.

Programming the function keys is no problem. Press the program key

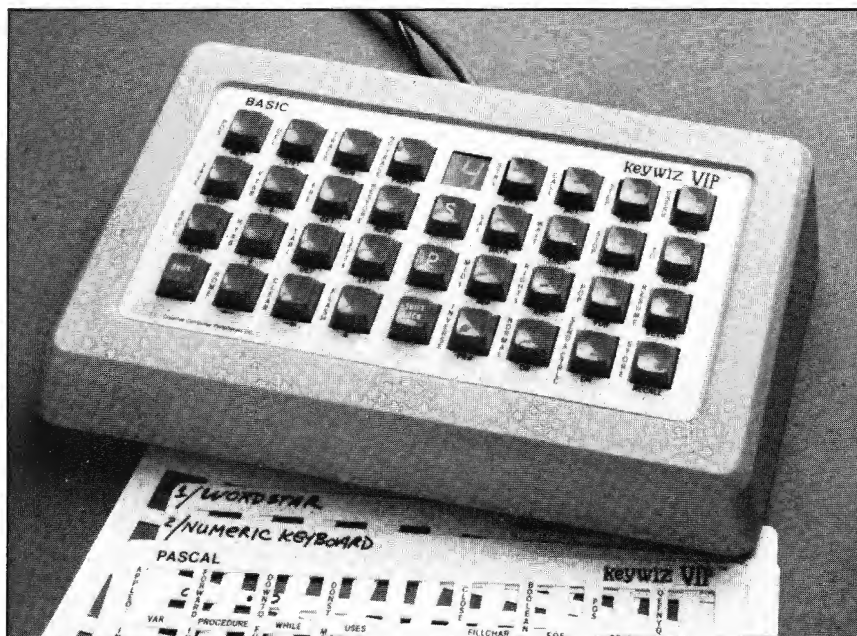
on the Keywiz. Press the function key you wish to program. Type the characters for the function on the Apple keyboard (up to eight characters). Press the program key again. That's it! The function key remembers what you typed.

Now you can program the Keywiz to do the hard stuff for you. If you want to have a key that types CHR\$(just put it in. You can program four keys with the ESC A, B, C and D. For complete cursor movement control HOME and CATALOG keys are useful. I have a line I type for listing a program on the printer that I use a lot when developing a program. It consists of "PR#1";"80N";LIST;"PR#0" and a return. I always seem to make mistakes or forget the control-D or control-I. I programmed four keys on the Keywiz that I press in succession to type the above command.

The unit comes with preprinted templates for Basic and Pascal and two blank ones on which you can write your own arrangements with a pencil or felt tip pen. Additional templates are available from the manufacturer at \$10 for four. This actually gives you eight templates since you can use both front and back.

Sounds great, but does it save you any time? If you are like me and have spent years at an Apple keyboard and can type at 40 wpm, it does not save a whole lot. One of the reasons is that you must remove your hands from the Apple keyboard to find a function key. Then you must move your hand back and find the home keys again. Personally I found that there was little time saved executing things like HOME, LIST, LOAD or SAVE. There was some time saved for things like CHR\$(, RIGHT\$(, LEFT\$(and similar commands that required multiple shifts. If you use the hunt-and-peck system of typing this kind of keyboard is valuable, especially if you are typing something which requires a lot of key shifts.

When used with commercial software there can be a considerable advantage. You can program all of WordStar's control character functions and label them in English.



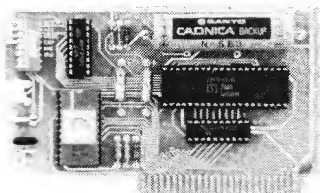
Close-up of the Keywiz VIP keyboard.

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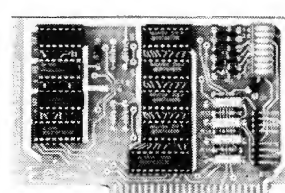
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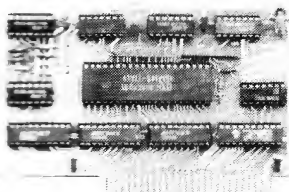
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SUPRTERM	MORE	NO	YES	NO	NO	NO	NO	YES	YES
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VISION80	MORE	YES	YES	NO	NO	YES	NO	NO	NO
OMNIVISION	MORE	NO	YES	NO	NO	NO	NO	YES	YES
VIEWMAX80	MORE	YES	YES	NO	NO	YES	NO	NO	YES
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The manual gives sample arrangements for VisiCalc, WordStar, Magic Window and Apple Writer II. It is easy to include a numeric keypad with your VisiCalc functions. You can program your favorite numeric keypad arrangement for entering numbers into any program. It could be a great timesaver in an office that does a lot of that sort of thing. You could even have different function key arrangements for different operators of the same piece of software. This is one of those frustrating products you just hate because the major limitation is your imagination.

There were a few things I didn't like. When I got it out of the box the red filter over the LED readout had broken off and was rattling around in the case. The mounting method was rather flaky and I think Keywiz will have a problem with this.

The wall transformer gets very hot, so hot I can hardly hold my finger on the case. For long life of the transformer, this is not a good situation. However, I would rather have the heat outside the Apple case than inside cooking all those Apple boards. It helps keep the load off the Apple power supply.

One of the connectors on the I/O board was so tall that it interfered with the board in the next slot. There

is, I feel, little excuse for this.

To use the shifted keys is sometimes a two-handed operation. You can use the shift-lock but that increases the number of keystrokes. Another problem is that the keyboard is about the same width as the Apple

"You can program your favorite numeric keypad arrangement for entering numbers into any program."

keyboard and takes up a lot of room on the desk.

The keys are so tall that the labels on the template hide behind them and thus you either have to lean over the keys to see the label or tilt the Keywiz up.

Overall I must give the Keywiz an above average rating. It is easy to program and use. It requires no Apple resources other than a peripheral slot. The manual is adequate. The quality of construction is average to good.

Since I program mostly in Basic and assembly language and am a touch typist, I found I did not use it

that much. If you only use your Apple for Basic, a typing course may be a better deal. But for a non-typist this unit will quickly become a favorite.

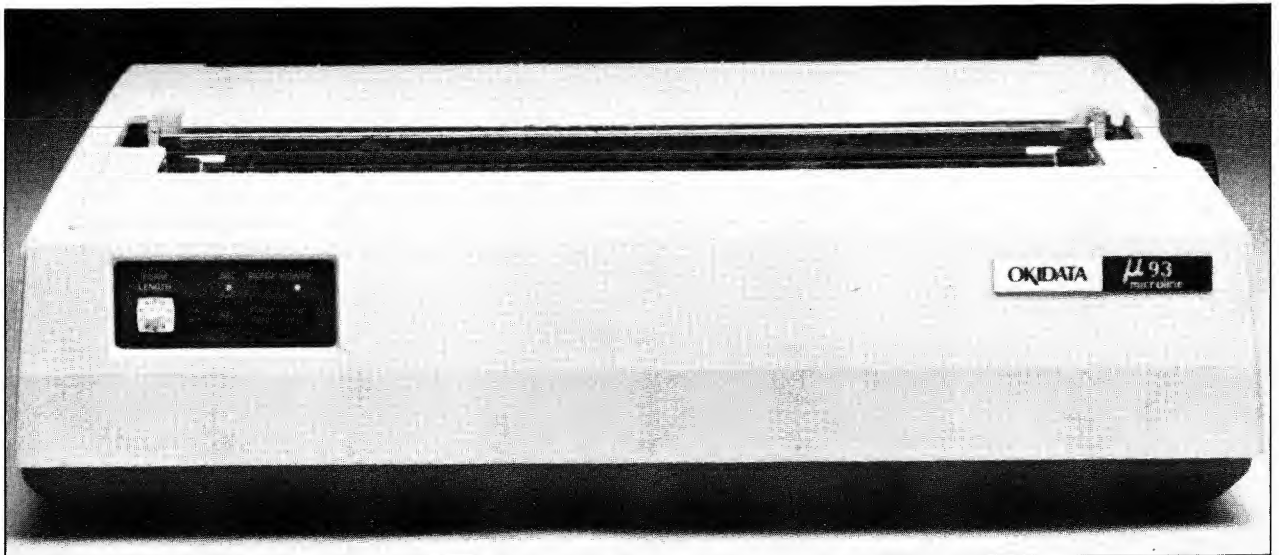
The Keywiz VIP is available from Creative Computer Peripherals Inc., Aztec Environmental Center, 1044 Lacey Road, Forked River, NJ 08731. The price is \$439 plus shipping. ■

Lee Sumner
Dallastown, PA

Microline 93

The Okidata Microline 93 is a dot matrix impact printer—one that forms printed characters by striking tiny wire-ends against paper with an inked ribbon between. By printing a pattern or matrix of such tiny dots on the paper, it forms letters, numbers and other symbols. You can even program Bit to print foreign alphabets or other special characters or graphic patterns.

The 93 accepts paper up to 15 inches wide, or 16 inches with perforations. This enables it to print up to 136 characters per line at 10 cpi (characters per inch), 163 at 12 cpi, or 233 at 17 cpi. You select which of these pitches you want by sending special characters to the printer di-



The Okidata Microline 93 Printer.

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System requirements: Wildcard: Apple II + w/64K, Apple IIe, Wildcard 2: Apple II, II +, IIe, Wildcard Plus: Apple, II, II +, IIe. All cards work with Franklin computers. An \$8.00 mod kit is required for Franklin 1000, 1200 (for use with Wildcard only).

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rectly from the keyboard or from a running program. Sending ASCII character number 30 to the printer, for example, selects 10 cpi.

There is a Double-Width mode available for each character pitch, so that you can specify five, six or eight and one half cpi for headings and special emphasis. While you cannot change the basic, single-width pitch in the middle of a printed line (say, from 10 to 12 cpi), you can switch between a given pitch and its double-width mode within a line. Thus, you can print most of a line at 12 cpi, but emphasize one or more words by printing them at six cpi. Keep in mind that your program must be able to send the proper commands to do this; some word processors, for example, do not allow such embedded commands.

The 93 offers you a variety of printout qualities suitable for different applications. For quick listings and rough drafts, it offers a Data Processing mode that spews out characters at 160 per second. In this mode, it forms the characters using a 9 by 9 dot matrix. Although you can clearly see that the characters are made of dots, they are readable.

You can get more solid characters at half the speed of the Data Processing mode by selecting the Enhanced or Emphasized mode. In these modes, each line of characters is printed twice: first as the printhead travels in one direction, and a second time as it travels back in the other direction. In both modes, the second printing is not directly on top of the first; it is slightly offset.

In the Enhanced mode, the printer advances the paper half a dot between printings. This makes the vertical lines within characters look more solid. In the Emphasized mode the paper does not advance, but the line is reprinted a half-dot's distance to the right of the first printing. This tends to make the horizontal lines look more solid. The two effects are slightly different, but both improve the print quality, making it darker and more solid. If you look closely, however, you can still see rounded

portions of the dots that form the characters.

Finally, for the best looking printout you can select Correspondence mode printing at 40 characters per second. In this mode, as in the Emphasized and Enhanced modes, the printhead goes over each line twice. In this case, however, both passes are in the same direction for maximum precision.

The characters printed in Correspondence mode are formed using a 9 by 17 matrix of dots. They look a bit more elegant than those printed in the other modes, with serifs added to make them less boxy. You have to study closely to see where individual dots are printed on the paper. However, you can see a raggedness to the lines that some typewriter-quality characters don't have.

The quality of the characters in Correspondence mode is excellent for a dot matrix printer. It should be acceptable for all but formal business use. The characters do look a bit thick, but this is the trade-off necessary to make them look so solid.

In addition to printing all the normal English characters, the Microline 93 also prints nine alternative sets of characters: British, German, French, Swedish, Danish, Dutch, Norwegian, Italian, and Radio Shack TRS-80. (What, you've never heard of the Duchy of Grand 80?) The 93 will print any character you can design with a 9 by 9 pattern of dots. It has some built-in RAM you can program with your own character set. There's no utility that helps you do that *easily*, but a reasonably good Basic programmer should be able to write one without too much trouble. The technical information needed to download such characters into the printer's memory is included in the user manual.

In addition to printing discrete characters in 9 by 9 matrices, you can also print graphic images with a resolution of 60 by 60 or 72 by 72 dots per inch—if you buy or write the appropriate software. The user manual describes how the printer translates a byte of data into a column of dots on

the printout and how you enter and leave the Graphics mode. But you can't just issue a command and have the contents of your hi-res graphics screen dumped out on paper. You need software to use the printer's graphic abilities in any practical way.

The user manual is quite good; it is clear, succinct and well organized. It provides concrete examples that clarify general instructions, and a quick reference guide is included. The manual does not assume that you are already a printer expert. It covers all the necessary territory without serious omissions.

The 93 has a variety of intelligent features I haven't yet mentioned. Using these features, you can select and deselect the printer, print subscripts and superscripts, and print underlined characters directly from the keyboard or under control of your software. You can also set the form length to any number of lines; set interline spacing by 144ths of an inch, up to 127/144 inch; set inter-character spacing by 120ths of an inch, up to 9/120 inch; set the left margin and up to 16 horizontal tab stops, either by character column or by dot column; move the printhead to any horizontal dot-column position between the margins; and program up to 12 different sets of vertical tab stops at once, with as many as 54 tab positions altogether.

Okidata claims the printhead is good for 200 million characters. They also claim the MTBF (mean time between failure) is 4000 hours. After doing a little arithmetic, I concluded that those two figures seem to say approximately the same thing. If you use this machine for an hour a week, it shouldn't need repair for about 4000 weeks, or 77 years. If you use it an hour every day, that still gives you about 11 years of smooth sailing. Accurate claims? I can't say. But the quality does look good.

The 93 accepts either cut sheets of paper or continuous paper with perforations. The tractor-feed mechanism used with perforated paper is a separate attachment that snaps on

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All times in seconds. (Time Test programs available)	DAVID DOS-II	ProDOS	DIVERSI DOS	DOS 3.3
TEXTFILES (100 Sectors)				
TSAVE	8.0	NO	NO	NO
TLOAD	6.2	NO	NO	NO
(791 Strings, 32 chars ea)	WRITE 29.3	28.0	29.4	88.4
	READ 24.3	16.3	24.3	83.8
(442 Sectors, 7 x 500)	PRINT/READ 44.2	45.9	45.1	117.1
	APPEND 142.3	142.9	151.1	1231.2
APPLESOFT (100 Sectors)	*SAVE 7.1	16.4	6.4	33.1
	LOAD 5.0	4.0	5.0	23.5
INTEGER (100 Sectors)	*SAVE 7.3	NO	6.6	33.4
	LOAD 4.9	NO	4.9	23.4
BINARY (100 Sectors)	*BSAVE 7.8	18.4	7.3	28.7
	BLOAD 5.8	4.8	5.8	24.5
48K PROGRAM SPACE (With 3 Bufs avail)	APPLESOFT 36,352	NO	36,352	36,352
	INTEGER 36,352	NO	36,352	36,352
	BINARY 36,352	34,816	36,352	36,352
64K PROGRAM SPACE (With 5 Bufs avail)	APPLESOFT 46,592	31,232	45,658	35,162
	INTEGER 46,592	NO	35,162	35,162
	BINARY 46,592	40,704	45,658	35,162
NUMBER OF DOS COMMANDS	37	29	31	28
CLOCK FILE DATING	YES	YES	NO	NO
MANUAL FILE DATING	YES	NO	NO	NO
ONE KEYSTROKE CATALOG	YES	NO	YES	NO
AUTO USE INTEGER CARD ANY SLOT	YES	NO	NO	NO

Each Program was tested twice W/Apple Clock Card on a newly formatted disk containing DOS.
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and off. That's not too much of a nuisance because installation or removal takes only a few seconds once you get the knack. You can feed paper either from the back or from the bottom.

Feeding the printer individual sheets of paper is not easy. In order to route the top edge of the paper under the paper bail (the spring-loaded rollers that hold it against the platen), you *must* lift off the top cover of the printer. That's not hard, but it's a nuisance. There should be guides that keep the paper close enough to the platen to slip between it and the bail.

The top edge of individual sheets also tends to jam against a metal bar when printing the first few lines on a sheet. When this happens, the moving printhead catches on the wrinkled paper and rips it from edge to edge. The solution is to leave the top cover off and allow the first few

lines to print with the paper bail released until the top edge of the paper gets past the metal bar. Then you can let the bail press against the paper for the rest of the sheet.

Changing the ribbon is a messy business, although there is some compensation for your dirty fingertips. The compensation is that the ribbons—open spools and not specially made cartridges—are cheap. But the ribbon stretches along the entire length of the platen and then back to the center where the spools are mounted. The spools do not move along with the printhead, but are fixed behind it. Consequently, it is easy to touch the ribbon while you change it and sometimes while you load paper or adjust the bail.

The front panel controls are fairly standard, with the welcome addition of the form-length switch. This is a lifesaver for anyone who regularly

uses two or more forms of different lengths. The other panel controls set the top-of-form and feed the paper a single line. Holding the linefeed button while powering up also initiates a self-test where the printer continuously prints characters until you press the formfeed button. Lights indicate power on, paper out and select/deselect.

In all, the Okidata Microline 93 is a capable and well built printer. It's very fast in its Data Processing mode, and by dot-matrix standards, it produces excellent quality print in its slower Correspondence mode. Okidata has a good reputation, and this printer promises to live up to their name.

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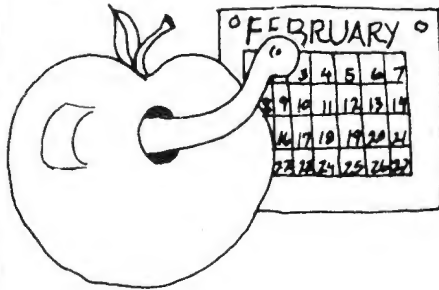


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February 2-4
Annual Conference on
Computer Simulations
 San Diego, CA
 contact:
 Gloria Rico
 Society for Computer Simulations
 PO Box 2228
 La Jolla, CA 92038
 (619) 459-3888

February 6-9
International Symposium on
Logic Programming
 Atlantic City, NJ
 contact:
 Dr. Joseph Urban
 University of S.W. Louisiana
 Box 44330
 Lafayette, LA 70504
 (314) 231-6304

February 7-10
Instructional Computing
Conference
 Orlando, FL
 contact:
 David Brittain
 Florida Dept. of Education
 Knott Bldg.
 Tallahassee, FL 32301
 (904) 487-3105

February 14
Introduction to Computers
 Princeton, NJ
 contact:
 Martin Schneiderman
 Educational Testing Service
 Princeton, NJ 08541
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February 14-16
The Future of Computing
 Philadelphia, PA
 contact:
 Frank Friedman
 Dept. of Computer &
 Information Science
 Room 303
 Computer Center Bldg.
 Temple University
 Philadelphia, PA 19122
 (215) 787-1912

February 14-16
A Look into the Future
 Cedar Rapids, IA
 Yakima, WA
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 NCTM
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 Reston, VA 22091
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February 15-17
Interactive Instruction Delivery
 Orlando, FL
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February 20-22
Office Automation Conference
 Los Angeles, CA
 contact:
 American Federation of
 Information Processing Societies
 1899 Preston White Drive
 Reston, VA 22091
 (703) 620-8955

February 21-23
Softcon Trade Fair
for Software Industry
 New Orleans, LA
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 Peggy Kilburn
 Northeast Expositions
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 Chestnut Hill, MA 02167
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February 22-25
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Personal Computer Show
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February 28-March 1
COMPCON Spring
 San Francisco, CA
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February 28-March 2
ACLD International Conference
 New Orleans, LA
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 ACLD
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 Pittsburgh, PA 15234
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February 29-March 3
Computers in the New Curriculum
 Austin, TX
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 Austin, TX 78768
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March 12-16
IEEE International Conference on Robotics
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March 14-16
Simulation Symposium
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March 15-16
Literacy Plus + Microcomputers in Education
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 Arizona State University
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March 22-23
West Coast Computer Faire
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 Newton, MA 02159
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March 24-26
National Educational Computer and Technology Conference
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International Conference on Software Engineering
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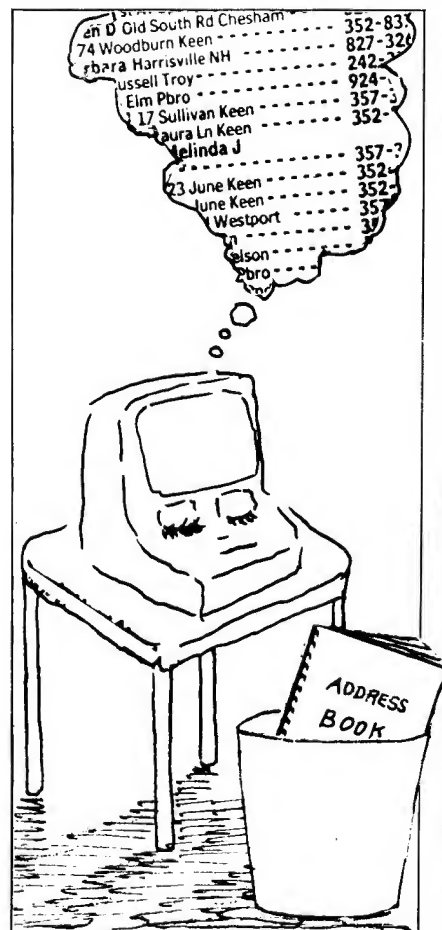
March 26-28
COMDEX in Japan
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March 30-April 1
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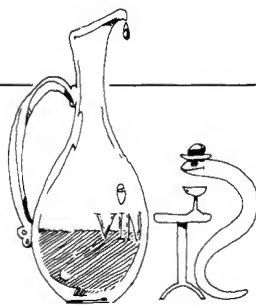
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If you are organizing, or otherwise know of, an event important to Apple users, and would like it listed in the inCider Calendar, please drop us a line at Pine Street, Peterborough, NH 03458. Include the name of the event, the date, the location, and the name of a contact for further information. —the editors

Cider Vinegar



Firefly Frolic, December

The listing for my "Firefly Frolic" article in the December *inCider* was inadvertently renumbered. The following table gives the correct correspondence between the article and the listing.

Text	Listing
95-100	110-140
120-130	150-170
135-145	180-200
150-155	210-220
160-170	230-250
180-200	270-310
205-315	320-540
320-425	550-770
350	610
430-435	780-790
440-545	800-1010
550-600	1020-1120
605-660	1130-1240
665-710	1440-1530
715-850	1540-1810
855-875	1820-1860
880-885	1870-1880
890-990	1890-2080
995	2110

I have also corrected a smudged DATA statement (line 2110) and a typo (line 1800).

```
2110 DATA 174,0,3,173,48,192,136,208,5,
206,1,3,240,9,202,208,245,174,0,3,76,5,3,96
1800 HLIN 4,6 AT 15: VLIN 15,17 AT 4:
HLIN 4,6 AT 17: VLIN 15,19 AT 6:
COLOR = 13: RETURN
```

I hope this clears up any confusion.

Douglas R. Werner
20 Seymour St.
Torrington, CT 06790

Create-A-Venture, August

I have received a few letters pointing out some problems with my "Create-A-Venture" article that appeared in the August issue. They are easily fixed.

1. On page 93 at the end of the Adventure subprogram, it says that the listing is continued. Not true. The program ends at line 13390.

2. In the Adventure subprogram, there is a misspelling in the "Help" routine. Line 6590 should read: INVERSE: PRINT "INV"; NORMAL: PRINT "ENTORY"; SPC(4); "... (ITEMS IN POSSESSION)";

3. The biggest problem concerns the control-S function used in the Creator subprogram. This is used periodically to save data entered as you go along, thus preventing loss of all your data should an accident occur. It doesn't work due to an error on my part. When control-S is hit, it saves all the data *except* the title information. When you try to recall the unfinished data files, the program first tries to get the title file. When it can't find it, it refuses to load the data file. Luckily, this problem is easily solved. Change these lines in the Creator subprogram:

```
8140 IF DO THEN GOTO 8160
8145 HOME
9030 IF CS = TRUE AND AN$ = CHR$(19)
THEN AN$ = CHR$(13): TS = TRUE:
CK = 0: DO = TRUE:
PROG$ = "" + MPROG$ + ".
TITLE":GOSUB 8160: DO = FALSE
```

I have introduced a new variable here, DO, which stands for Display Off. It prevents any disk messages from being printed to the screen, thus keeping the text intact.

I wish to thank those who have written me in regard to these problems.

Gary Cage
5416 E. Verde Lane
Phoenix, AZ 85018

Converting CP/M Files to DOS, November

Some of the program lines from the November article "Converting CP/M Files to DOS" were badly smudged. Here are the worst.

```
480 T$ = "??":GOSUB 3220: FOR I = 1 TO
300: NEXT: GOTO 445
3040 CALL GIOB: IOB = 256 * PEEK (73)
+ PEEK (72)
```

—the editors

File Card Formatter, October

Several people have contacted me concerning bugs in my "File Card Formatter" article published in the October issue of *inCider*. First, the program hangs when certain characters are entered. To overcome this, insert the following line: 281 IF ASC(L\$) < 32 OR ASC(L\$) > 99 THEN 245. Another problem is trying to erase a control character when that character is the first item on a line. The easiest solution is to turn off the control code rather than trying to erase it.

Also, the length of the shape table is \$393 and not \$392. And if you're having problems controlling the printer with a simple PR#1, then try PRINT CHR\$(4) before it. Finally, you can use File Card Formatter on larger index cards, keeping in mind that there is a limit of 1325 characters per card.

William P. Smith
RD# 2
Cold Spring Creamery Road
Doylestown, PA 18901

inCide Out, December

The *inCider* staff was so busy admiring the photo of itself published in the December issue that it forgot to give proper photo credit. Thank you, S.F. Tomajczyk!

—the editors

inSidious inSolubles Solution, from p. 129

Here is the solution to The Chess Board (Listing 1):

```
30 COLOR= 15: IF (X + Y) / 10 <
> INT ((X + Y) / 10) THEN
COLOR= 0
```

Every good programmer and chess player knows that the lower-right square on a chess board should be *white*.

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ATC Software's 80-page manual, "How to Profitably Sell Your Own Software," guides programmers in selling their software creations. Information is given on obtaining national directory listings, pricing a software product, writing a user's manual and operating a successful mail order service—all for \$20 from ATC Software, Box 448, Estill Springs, TN 37330.

Programming for Microcomputers

Indiana University Audio-Visual Center has released 13 half-hour video programs (\$1950 or \$150 per title) for use with a textbook, *Programming for Microcomputers: Apple II Basic*, published by Houghton Mifflin for \$15.95. Contact the Audio-Visual Center at Indiana University, Bloomington, IN 47405, for more information.

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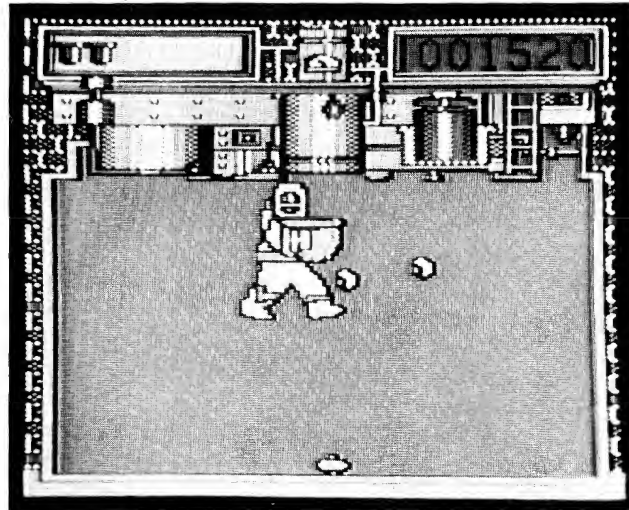
Stickybear Programs for Kids

Weekly Reader Family Software announces Stickybear Basketbounce, which offers a multi-level game for the entire family to win points by catching colorful bouncing bricks, doughnuts or stars before running out of baskets.

Two programs for children, three to six years old, teach opposites (Stickybear Opposites) and shapes (Stickybear Shapes). All programs retail for \$39.95. Contact Xerox Education Publications, Computer Software Division, 245 Long Hill Road, Middletown, CT 06457, for more information. Reader Service number is 460.

grade data, computes class averages for each item graded, computes final grades, and does many other tasks. It is available for both secondary grades and above (Upper Division)

and for pre-secondary teachers (Lower Division) for \$19.95 each from Indian Head Software, 1002 Indian Head Drive, Snow Hill, NC 28580. Reader Service number is 456.



Stickybear Learning Games.

Compose Music

Experienced and inexperienced musicians can compose and play their own music on the Music Construction Set from Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403. Users manipulate an on-screen "hand" with a joystick, keyboard or touch pad to position notes, rests, sharps, flats or other musical symbols on a formatted staff, then can hear how it sounds immediately. Suggested retail price is \$40. Reader service number is 463.

Grades Manager

The Grades Manager provides a head count, creates and maintains a class roster in alphabetical order, adds or deletes a student, enters and edits

The Alpine Encounter

Vodac, a sinister organization, has stolen the plans for the world's first invincible missile. You must recover the plans to avert a worldwide disaster. Vodac, an interactive adventure, features 93 full-color scenes, 28 personalities, sound effects and two-voice music. It is available for \$59.95 from Ibidinc, 179 Allyn St., Suite 6-7, Hartford, CT 06103. Reader Service number is 462.

Keep "My Secret"

This Apple data encryption/decryption program protects any kind of DOS 3.3 file by scrambling entire disks or selected files so they can be read only by entering your password. It is available for \$19.95 from Anthro-Digital Inc., PO Box 1385, Pittsfield, MA 01202. Reader Service number is 451.

Dump Your Apple III

Attach.Driver allows Apple III users to dump a screen full of text from any program to any printer at any time with a single keystroke and no additional hardware. The suggested retail price is \$29.95. Contact Soft-Life Corp., Dept. N, 2950 Los Feliz Blvd., Suite 103, Los Angeles, CA 90039, for further information. Reader Service number is 453.

Stars in Your Computer

Astrocalc is an astronomical program for anyone interested in the sky



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Networker Communications Software is an easy to use terminal program that turns your computer into a communications command center, with on-screen "help" menus, continuous updates of memory usage, carrier presence, and communication status. Even a beginner can be communicating in seconds.

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and its observation. Date, time and location (latitude and longitude) are input and Astrocalc calculates and displays all basic data for the sun, moon and all planets. Astrocalc is available for \$29.95 from Zephyr Services, 306 South Homewood Ave., Pittsburgh, PA 15208. Reader Service number is 454.

The Great Creator

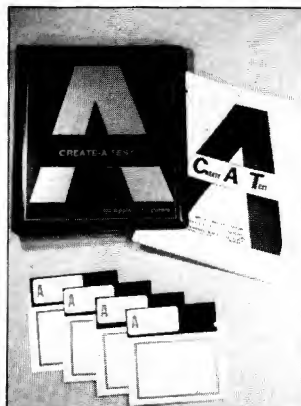
The Great Creator lets you create multiple-choice and fill-in-the-blank questionnaires on the computer in the language of your choice. The program contains character sets for 16 different accented languages besides English. Suggested price is \$399.95, from Gessler Educational Software, 900 Broadway, New York City, NY 10003. Reader Service number is 468.

Vindicator

A fast game with smooth animation, lots of moving shapes and sound is Vindicator from HAL Labs, 4074 Midland St., Riverside, CA 92505. It is set in a world where everything is out to get you. You are a heavily clad hero with only rapid fire lasers to defend yourself and eight eggs from zillions of aliens. Suggested retail price is \$25. Reader Service number is 458.

Computerized Road Atlas

Roadsearch-Plus simplifies the tedious process of determining driving routes for anyone who travels over the interstate highway sys-



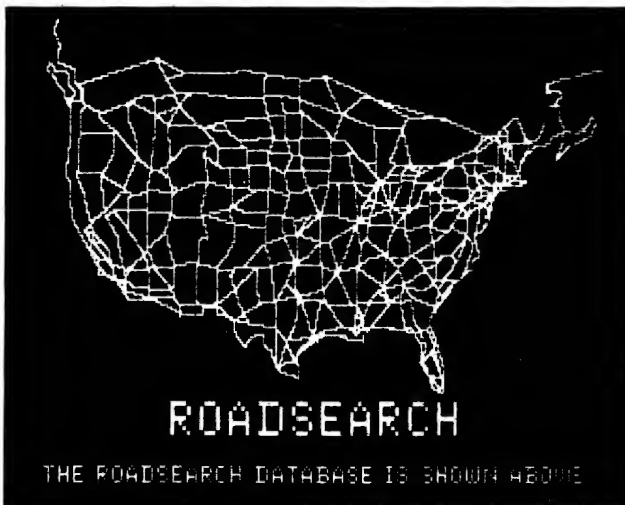
Easy testing with Create-A-Test.

tem. It computes the shortest, most practical routes between cities and avoids toll roads if desired. A database of 406 cities/road intersections and 70,000 miles of interstate and major through highways throughout the U.S. and Canada is included. Printouts include the driving route, distances, travel times and fuel usage in different formats. The suggested retail price is \$74.95 from Columbia Software,

PO Box 2235A, Marsh Hawk, MD 21045. Reader Service number is 466.

Create-A-Test

Cross Educational Software announces a test writing program for classroom management. With Create-A-Test, teachers can select questions from question disks and print them out to produce formatted tests in as little as ten minutes. The question disk has 21 questions. Suggested price is \$49.95 each. The program is available from Cross Educational Software, 1802 N. Trenton St., PO Box 1536, Ruston, LA 71270. Reader Service number is 455.



The end of the road.

Amperfinesse

Powerful line editing as well as sound and graphics commands are part of Avant-Garde's new programmer's utility, Amperfinesse. Applesoft Basic is given the power of Fortran and also allows data disks to be initialized without DOS. Suggested retail price is \$79.95. Contact Avant-Garde, PO Box 30160, Eugene, OR 97403, for further information. Reader Service number is 461.

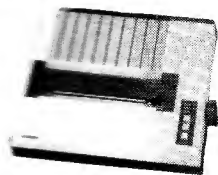
Secret Agent: Mission One

An evil scientist threatens to destroy the world—and only you can stop him. This sophisticated new graphics adventure invites you to outwit and outmaneuver a wily opponent. The program is written in Applesoft

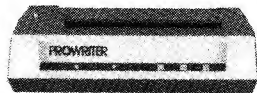
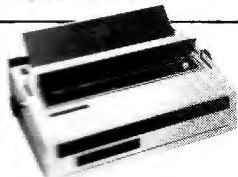
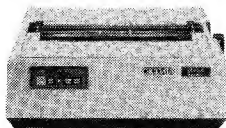


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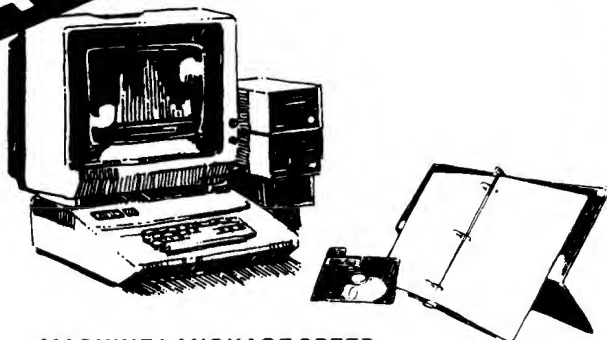
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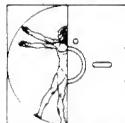
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and assembly language for quick action and intricate hi-res screens. Timorous adventurers can save the game in risky situations. It's \$29.95 from Jor-And, PO Box 9180, Glendale, CA 91206. Reader Service number is 469.

Coin Collectors Rejoice!

Coins is a program now available for the Apple for numismatists to catalog an entire collection and obtain various reports that offer personal investment information. The program is priced at \$95 with quarterly updates for automatic re-evaluation of your collection for \$25. For more information, contact CompuQuote, 6914 Berquist Ave., Canoga Park, CA 91307. Reader Service number is 457.

Are You Wasting Energy?

Shelter Software's program, Home Energy Optimizer, helps you to make major reductions in your household fuel expenses by carefully analyzing your home. The program calculates whether your home or its heating system wastes energy, then recommends steps to save energy. Priced at \$39.95, the program is available from Shelter Software, Box 521, Emmaus, PA 18048. Reader Service number is 459.

Winning on Wall Street

Winning on Wall Street is an integrated software system for stock market investors and traders. It includes the following pro-

grams: Trader's Data Manager, a database module with interactive graphics and reporting; Trader's Forecaster, a forecasting and technical analysis tool kit; and Trader's Accountant, a portfolio management module that provides ten reports. The complete system retails for \$700, or programs can be purchased separately from Summa Software Corp., PO Box 2046, Beaverton, OR 97075. Reader Service number is 450.

New Word Processor

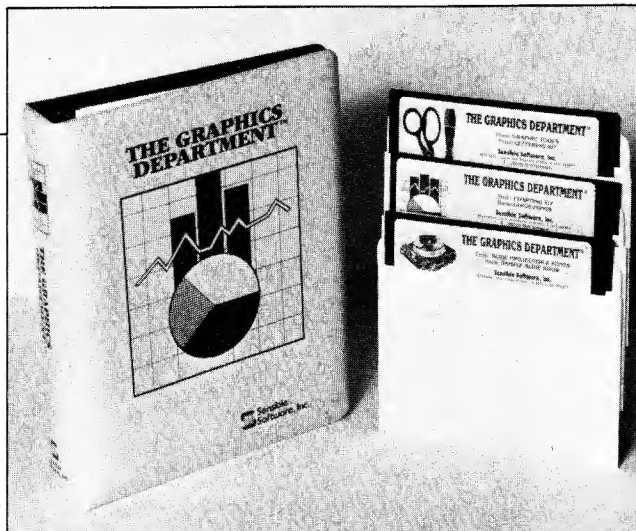
Home Writer, a word processor from Micro Lab Inc., creates and prints documents for \$49.95. An additional feature is the electronic card file for letter writing and conditional printing that permits merging of mail lists and personalizing documents. Single key commands make this program easy to learn. Contact Micro Lab Inc., 2699 Skokie Valley, Chicago, IL 60035, for more information. Reader Service number is 464.

Design Your Own Lessons

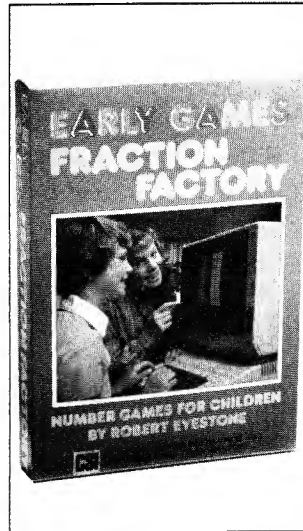
With the Apple Authorizing System, teachers and trainers can create interactive, self-paced computer-based lessons without the need for programming skills. On-line helps prompt the user throughout the lesson. Graphics can be created and modified by using a few simple commands. The package includes four disks and a manual for \$255 from Courseware Inc., 10075 Carroll Canyon Road, San Diego, CA 92131. Reader Service number is 465.

Graphics Department

Plotting, charting, lettering, graphics editor and slide projector are graphic tools in the Graphics Department. It can be used with all Apple II's. The price is \$124.95 at your local dealer or from Sensible Software, 6619 Perham Drive, West Bloomfield, MI 48033. Reader Service number is 452.



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Learning Games

Three new learning games from Counterpoint Software offer learning opportunities. Early Games Piece of Cake leads children

into a magical bakery where they learn to add, subtract, multiply and divide.

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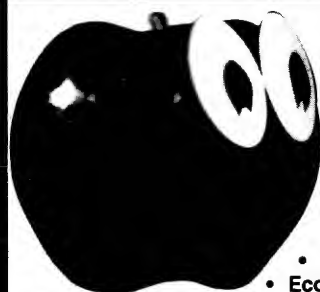
elementary and junior high students.

Preschoolers are guided through a series of six discrimination and matching games involving colors, shapes, sizes, lines and directions, facial expressions

and reversible letters in Early Games Matchmaker.

All games are available for \$29.95 from Counterpoint Software Inc., 4005 West Sixty-fifth St., Minneapolis, MN 55435. Reader Service number is 467.

Circle 204 on Reader Service card.



LET YOUR APPLE SEE THE WORLD!

The DS-65 Digisector® opens up a whole new world for your Apple II. Your computer can now be a part of the action, taking pictures to amuse your friends, watching your house while you're away, taking computer portraits . . . the applications abound! The DS-65 is a random access video digitizer. It converts a TV camera's output into digital information your computer can process. The DS-65 features:

- **High Resolution** — a 256 × 256 picture element scan
- **Precision** — 64 levels of grey scale
- **Versatility** — Accepts either NTSC or industrial video input
- **Economy** — A professional tool priced for the hobbyist

The DS-65 is an intelligent peripheral card with on-board software in 2708 EPROM. Check these software features:

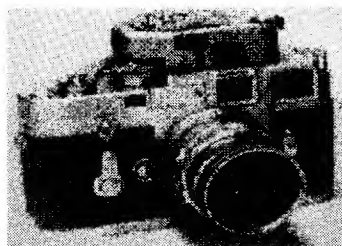
- Full screen scans directly to Apple Hi-Res screen
- Easy random access digitizing by Basic programs
- Line-scan digitizing for reading charts or tracking objects
- Utility functions for clearing and copying the Hi-Res screen

Use the DS-65 for precision security systems; computer portraiture; robotics; fast to slow scan conversion; moving target indicators; reading UPC codes, musical scores and paper tape and more! **GIVE YOUR APPLE THE GIFT OF SIGHT!** DS-65 Price: \$349.95 / FSII Camera Price: \$299.00 / Combination Price: \$599.00

ADDITIONAL SOFTWARE FOR THE DS-65

— **Picture Scanner:** An applications tool for processing video images for display on the Hi-Res screen. A variety of dithering algorithms are provided, for compressing the digitized image into the Hi-Res screen and simulating grey scales. Price: \$39.95

— **Superscan:** Enables you to enhance the DS-65's Hi-Res pictures with colors! Choose from 21 different colors and assign them to grey scale values, modify pictures, zoom, enhance contrast, etc. Includes print routines for Anadex 9500 or 9501; Epson MX-80GFT and MX-100; and IDS 460 Paper Tiger*. Written for The Micro Works by Magna Soft. Price: \$79.95



HI-RES PICTURE USING THE DS-65 AND PICTURE SCANNER SOFTWARE

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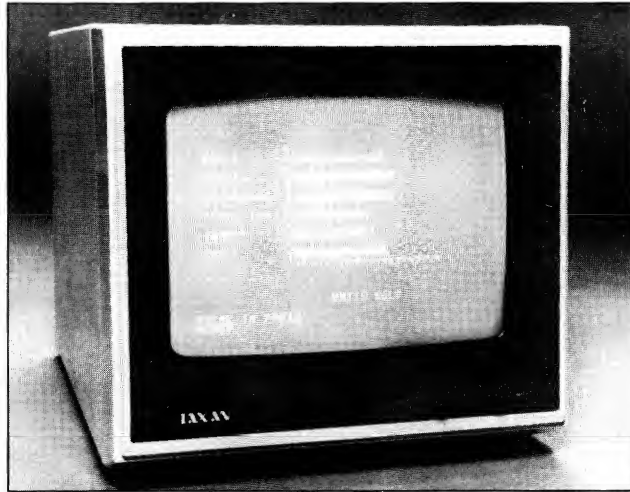
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New Products

edited by Joan Witham

RGBvision 210 Monitor

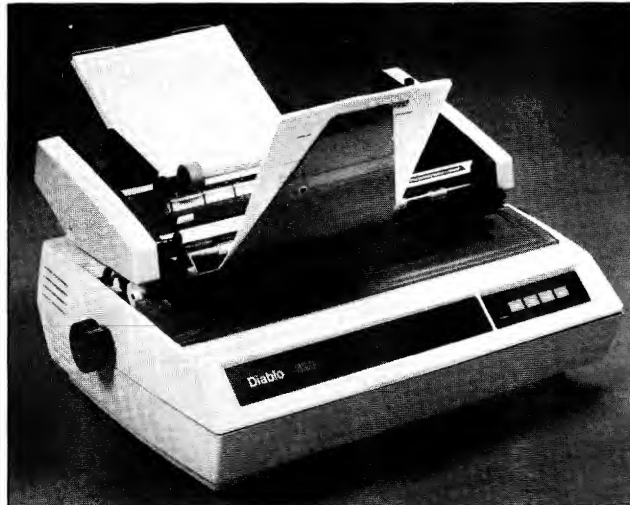
The Color Monitor has a medium resolution (380 horizontal lines) and .63mm slit pitch with 15 MHz bandwidth. It features on/off volume control and contrast on the front, as well as brightness, sharpness, color and hue controls on the back. A removable glare-screen is also provided. The price is \$399 from local dealers or TSK Electronics Corp., 18005 Cortney Court, City of Industry, CA 91748. Reader Service number is 471.



RGBvision 210 Color Monitor.

Paper Feeder

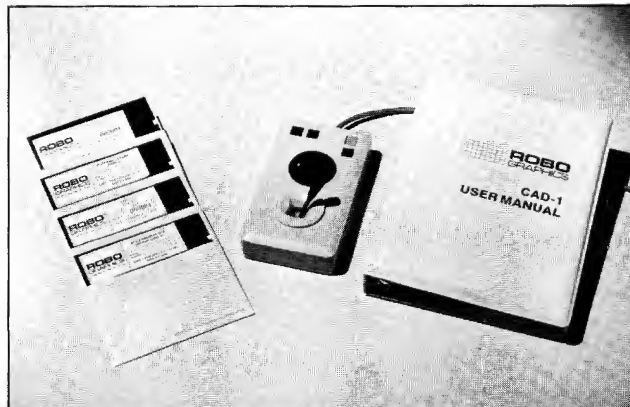
The Personalfeeder reduces time-consuming paper handling for personal computer users by automatically inserting, removing and collating cut sheets of paper. It is available for most Diablo, Qume, Ricoh, NEC and TEC printers. The recommended price is \$495 from Ziyad Inc., 100 Ford Road, Denville, NJ 07834. Reader Service number is 473.



The Personalfeeder eats up time.

Robographics CAD-1

The CAD-1, a computer-aided drafting and design system, connects to the Apple II Plus or IIe and produces scaled technical drawings and custom graphics. For \$4920, the complete package includes a controller, software, user manual and an interface module from Chessell-Robocom Corp., 125 Pheasant Run, Suite 2B, Newtown, PA 18940. Reader Service number is 475.



Robographics CAD-1 is a drafting and design system.

Zoom in With Graphmax

Graphmax, a graphics printer card for the Apple, provides zoom magnification up to 99 times with full picture cropping. More powerful than the Grappler, it is available for \$159.95 from Micromax Systems Inc., 6868 Nancy Ridge Drive, San Diego, CA 92121. Reader Service number is 490.

Expanded Storage

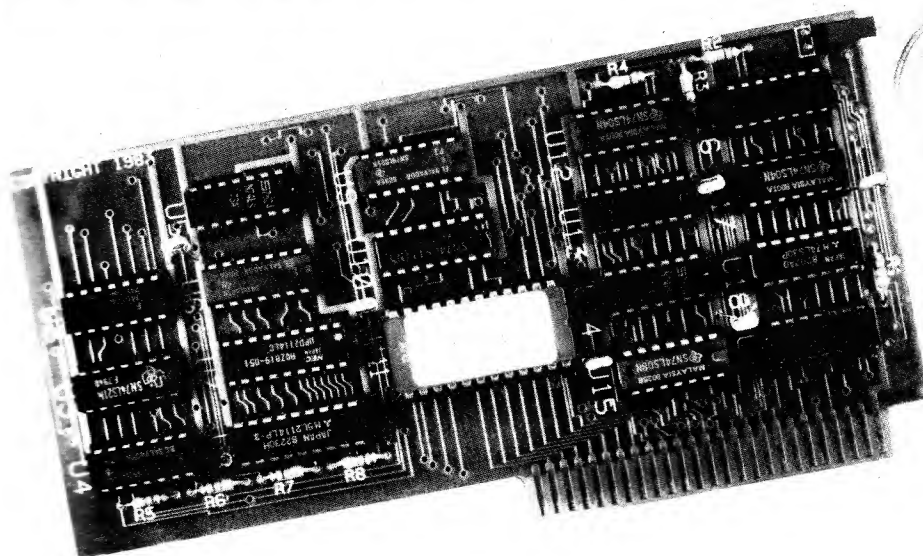
The DiscMaster II board allows you to connect two 8-inch or two 3 1/2-inch double density disk drives to your Apple II or Apple-compatible computer. The DiscMaster II package for \$265 includes software drivers to run under DOS 3.3, Pascal 1.1 and Microsoft CP/M. It is available from Data-Cue, 5696 Hwy. 431 South, Brownsboro, AL 35741. Reader Service number is 485.

Apple Serial Card III

For Apple III users who require more than one serial communication device, Apple Computer has announced the Apple Serial Card III. By inserting up to four cards in the Apple III's internal slots, a user can communicate with a variety of modems, plotters, printers and other serial communications devices. Suggested retail price is \$225. For further information, contact Apple Computer Inc., 10260 Bandley Drive, Cupertino, CA 95014. Reader Service number is 470.

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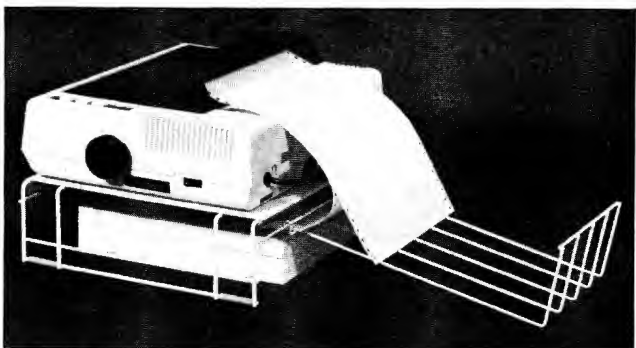
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Micro-Analyst, Inc.



TouchBase 2 controls static and fatigue.



Paper Tamer.

Classic Static Control

The TouchBase 2 slides under the front edge of the Apple computer to provide comfortable wrist support. It combats fatigue and static electricity downtime. Suggested retail price is \$49 from Omnium Corp., 201 North Second St., Stillwater, MN 55082. Reader Service number is 477.

catches and folds printouts. Suggested retail price is \$35.95 plus \$2 S/H from Micromate Accessories, 5801 Duluth St., Suite 105, Minneapolis, MN 55422. Reader Service number is 483.

68000 Board

QPAK-68, an add-in board and software package that turns the Apple II into a low-cost 68000 assembly language development system, is intended for engineers, researchers, programmers, etc. who want to learn the 68000. At \$695, the complete system includes a plug-in board to

Paper Tamer

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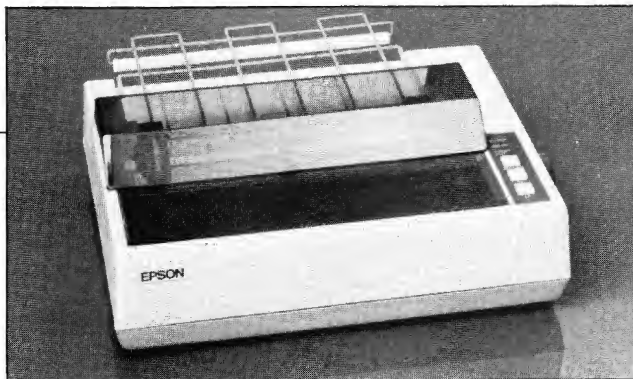
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Epson RX-80 F/T printer.

run 68000 programs, a combined Editor/Assembler to create 68000 source code, a Debugger for testing it and a variety of documentation and reference material for learning how the 68000 works. For more information, contact Qwerty Inc., 9252 Chesapeake Dr., Suite 600, San Diego, CA 92123. Reader Service number is 491.

RX-80 F/T

Epson America Inc. has released the RX-80 F/T dot matrix printer, which comes standard with tractor and friction paper feed in addition to all the features of the original RX-80 model. The RX-80 F/T has a printing speed of 100 cps, with a choice of two full 96-character ASCII sets,

plus nine international character sets, including 128 type styles. The RX-80 F/T is available from Epson America, 3415 Kashiwa St., Torrance, CA 90505 at a suggested retail price of \$599. Reader Service number is 486.

document is then printed and delivered by Purolator to its destination. Four-hour service costs \$25, while overnight service costs \$6. For further information, contact Purolator Inc., 265 Old New Brunswick Road, Piscataway, NJ 08854. Reader Service number is 481.

MCI Mail

MCI, a long-distance telecommunications company, will offer an electronic mail service called MCI Mail that allows any office automation device or personal computer to transmit a message directly through MCI's nationwide network to 15 major markets in the U.S. A hard copy of the

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Ramcracker Plus

Polycard Industries features the Ramcracker Plus with 16K RAM to back up copy-protected programs. It can be used as a debugging tool also and will instantly freeze a program—great for games. Suggested retail price is \$175 plus \$3 for handling from Polycard Industries, Box 278, Pitt Meadows,

British Columbia V0M 1P0. Reader Service number is 484.

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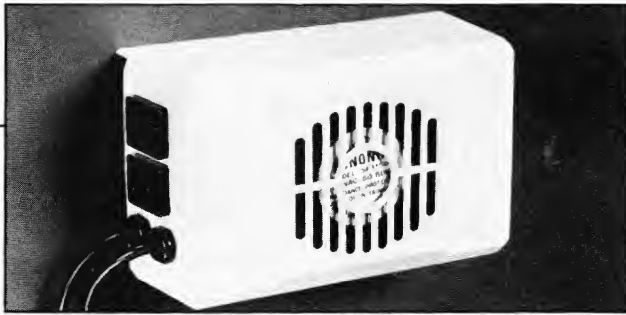
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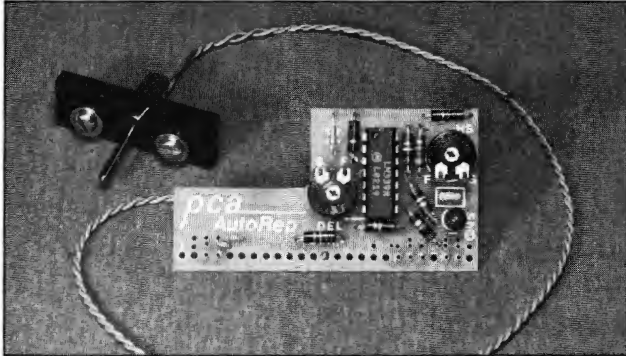
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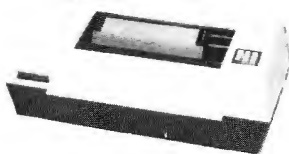
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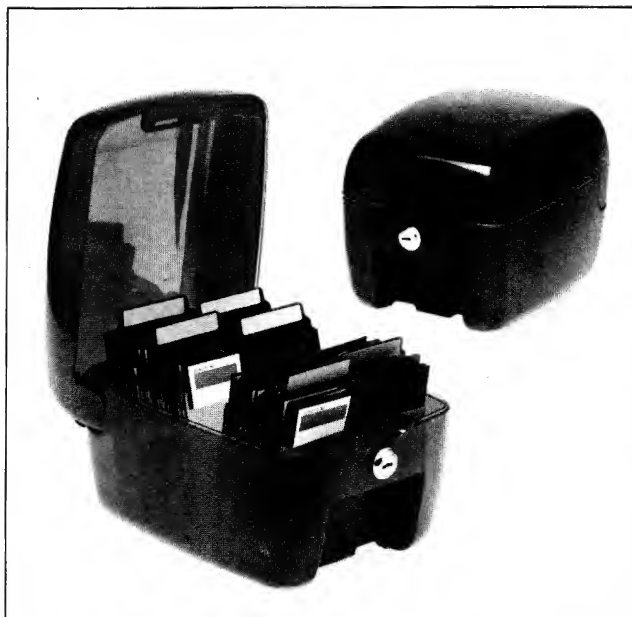
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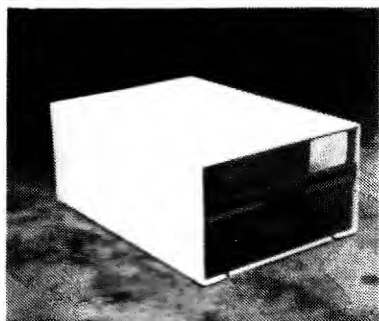
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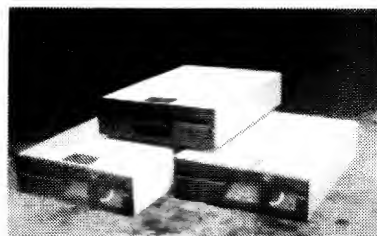
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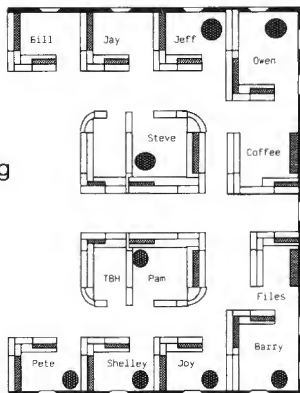
John --

January 27, 1983

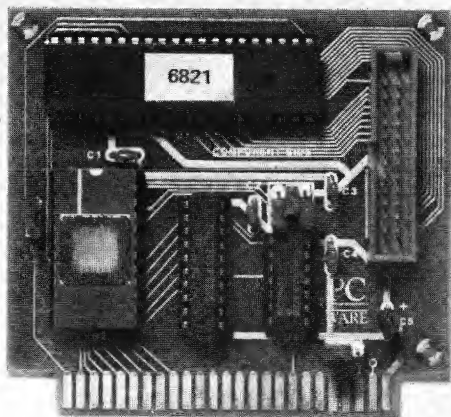
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Northeast Wing
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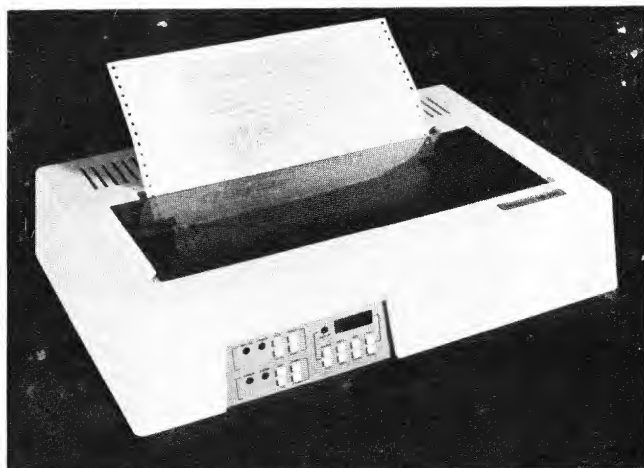
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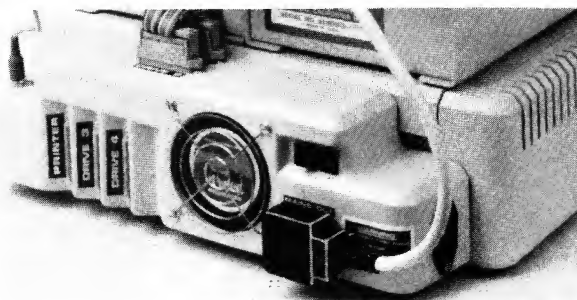
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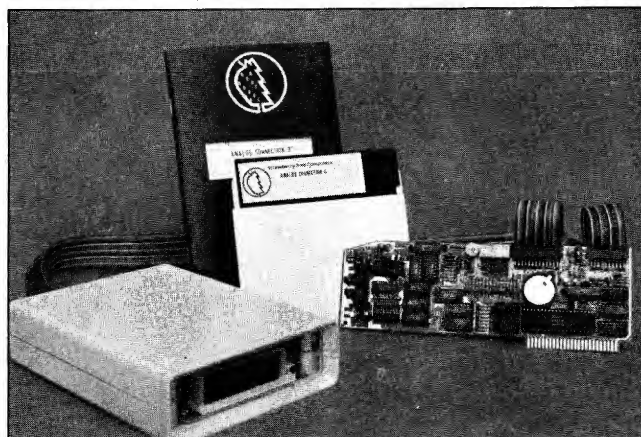
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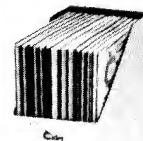
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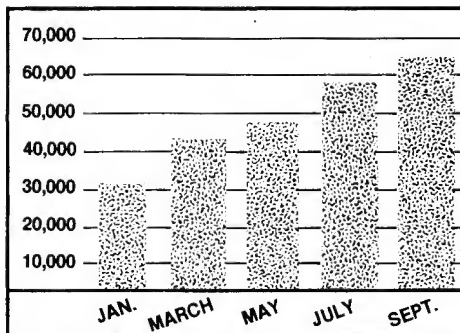


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